

Metals Review

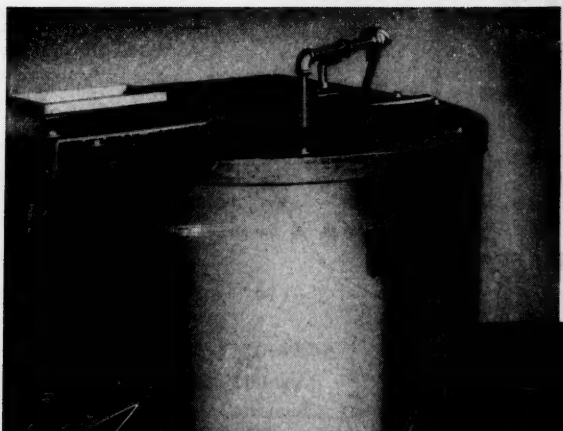
THE NEWS DIGEST MAGAZINE

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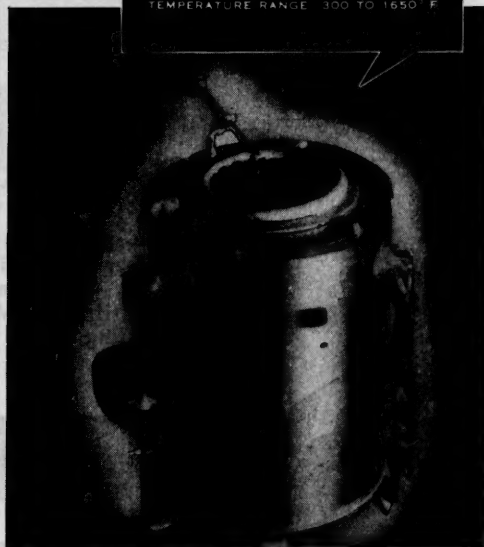
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Metals Review

THE NEWS DIGEST MAGAZINE



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(3) APRIL, 1952

Milwaukee Honors New Silver Jubilarians



At the January Meeting the Milwaukee Chapter A.S.M. Honored Four New Silver Jubilarians. Elmer Gammeter, national trustee, presented 25-year certificates to J. J. Chyle, F. C. Frentzel, Jr., E. G. Guenther, and F. L. MacNamara, thus bringing the group to a proud total of 28 members, of which 17 were present for the celebration and picture. Shown are, front row, from left, C. W. Windfelder, F. L. MacNamara, J. J. Chyle, H. C. Frentzel, Jr., E. G. Guenther

and C. F. Scheid. Rear row, from left, are G. B. Kiner, chapter chairman, Adam Rauch, Elmer Gammeter, B. F. Reed, C. I. Wesley, J. F. Hushek, J. E. Schoen, James Sorenson, Emanuel Yunk, John Webber, C. S. Moody, W. H. Naegely, and George A. Roberts, national trustee. Dr. Roberts, principal speaker of the evening, presented a talk on "New Developments in Toolsteels". (Reported by Donald R. Mathews, Photo by Mark Wallesz)

Economic Industrial Use Of Nuclear Power Still 25-50 Years in Future

Reported by Almen Leach
Metallurgy Dept., Bell Aircraft Co.

The utilization of nuclear power for industrial purposes must await the development of engineering materials. A large group of metallurgists present at the Buffalo Chapter A.S.M. February meeting, heard Leo F. Epstein outline the advances which must be made before nuclear power will become a practical reality.

Dr. Epstein is associated with the A.E.C.'s Knolls Atomic Power Laboratory, operated by the General Electric Co., which is engaged in the development of a reactor for the atomic-powered submarine.

It has been estimated that it may be 25 to 50 years before atomic power will compete with other sources economically, Dr. Epstein pointed out. Of profound interest to metallurgists is the knowledge that the great majority of obstacles to the economic use of nuclear fission lies in their field of activity.

The peculiar characteristics demanded of structural materials, moderators, heat transfer agents, and shielding admit of few materials that can be considered usable. Moderators are a good example. Graphite has proved to be one of the most successful materials because of its low

atomic weight, low neutron absorption, monatomic form, and extremely high melting point, yet it has one major drawback in not possessing mechanical strength. Moderators are placed within nuclear reactors to reduce the speed of neutrons. Monatomic elements are preferable for such applications because of the tendency of poly-atomic materials to degenerate under the effects of radiation. This is true of all materials (such as coolants), which might be even remotely exposed to radiation. Organics are entirely unsatisfactory for high-temperature nuclear power plants as they degenerate rapidly.

Shielding is one of the major problems in manufacturing portable power sources. Necessarily heavy and bulky, it limits the use of nuclear power to transports of very large size, such as ships. Great strides have been made in this field, however, as demonstrated by the fact that the weight of shielding is no longer considered an insurmountable obstacle in powering aircraft with reactors.

Dr. Epstein pointed out that though a tremendous amount of total energy is available in a reactor, the rate at which it can be extracted and put to work is dependent solely on the efficiency of a heat transfer agent. Since the amount of fissionable material is limited by the critical mass, greater power outputs cannot be obtained by enlarging the reactor itself, but must be gained by other

methods, such as flowing the heat transfer medium at higher and higher velocities and using one of maximum efficiency. Gases are not generally considered satisfactory for this application because of their low heat capacities and the need for a pressurized system. Liquids must have good heat transfer characteristics, low melting point, high boiling point, and thermal and radiation stability in order to be useful. They must also be capable of high pumping efficiencies, for such high velocities are anticipated that flow will be in the turbulent region.

Dr. Epstein disclosed that General Electric will attempt the use of metallic sodium as a coolant in the power system they are studying for the atomic submarine. (See March *Metal Progress*, p. 71). It fulfills the requirements for this component, but a very tight circulating system must be engineered, not only to eliminate the oxidation of the sodium, but to prevent the escape of radioactive particles.

Branch Warehouses Opened

A new branch office and warehouse have been opened by the Uddeholm Co. of America, Inc., of New York, in Los Angeles. This new branch will distribute tool and die steels as well as cold rolled strip specialties.

The company has also opened a warehouse in Cleveland to distribute tool and die steels.

Indianapolis Hears Johnson Discuss Low-Density Metal

Reported by George F. Sommer
Metallurgist, Link-Belt Co.

"New Developments in the Field of Low Density Metals—Magnesium, Aluminum, and Titanium" was the subject of a talk presented before the Feb. 18th meeting of the Indianapolis Chapter A.S.M. by J. B. Johnson, chief of the metallurgy group, Flight Research Laboratory, Wright-Patterson Air Force Base.

The speaker reviewed the development of an aircraft research program by the Air Force, which naturally led into the field of the low-density alloys. Aluminum was the first low-density metal to be used for structural parts, but the shortage of high-grade bauxite ores in this country led to a search for ores of other low-density metals which would have a strength-weight ratio comparable to aluminum.

Magnesium has been intensively investigated, since it is found in the brine deposits in Michigan, ocean water, and the western deserts—the supply of raw material is apparently unlimited. Although magnesium lacks chemical stability when exposed to marine atmospheres, many protective films and coatings have been developed which give satisfactory protection if the service is not too severe. An anodic surface treatment with the addition of organic protective coatings has given very good results on the magnesium alloy parts of the B-36 bomber.

The addition of Mischmetal to magnesium to increase the creep strength at elevated temperature (400 to 600° F.) has been successful, and these cast alloys have a relatively high strength-weight ratio compared to other metals. Thorium also offers promise for this purpose.

Zirconium and titanium were investigated for aircraft applications, and the latter has shown exceptional promise. The former has applications in the field of atomic energy which make it less available for aircraft, and, in addition, it is somewhat heavier.

Titanium has created great interest because of availability, strength-weight ratio, corrosion resistance, high-temperature properties, and fatigue strength. It is estimated that there is enough ilmenite, which is the principal ore of titanium, to last 100 years at the present rate of consumption of aluminum. Mr. Johnson pointed out that aluminum cost \$8 per pound in 1888 and now is down to 20 cents per pound. Titanium will eventually follow the same trend, but its decrease in cost is hampered by

inflation and the re-armament program, together with the lack of civilian applications and a competitive market.

The difficulty of producing the commercially pure titanium from its ore is also reflected in the high price. Principal disadvantages of titanium are its relatively poor machinability, which is not much better than the cobalt-base high-temperature alloys, a tendency to gall on deep drawing operations, and low oxidation resistance above 650° C.

Mr. Johnson illustrated the heat treatment of titanium alloys by giving a brief description of the titanium-chromium binary phase diagram and showing some of the time-temperature-transformation curves for the alloys below the transformation temperature of cubic beta to hexagonal alpha. Additional interesting data were shown on the effect of chromium on the hardness of titanium, and the strength at 750 to 800° F. where the strength-weight ratio is superior to stainless steel.

Shows Metallurgy-Design Relationship



Speaker Oscar J. Horger (Center) Talked Before the February Meeting of the Texas Chapter on the "Relationship of Metallurgy and Design". At left is H. C. Dill, chief metallurgist, Hughes Gun Co., chapter chairman, and right, M. W. Phair, salesman, Tennessee Coal, Iron & R. R. Co., vice-chairman. (Photo by Leland V. Dolan)

Reported by C. L. Horn
Metallurgist, Hughes Gun Co.

Oscar J. Horger, chief engineer, railway division, Timken Roller Bearing Co., impressed upon approximately 100 members present at the February meeting of the Texas Chapter A.S.M. that stresses induced by manufacturing methods may cause products to fail, even though they have been properly designed. He further stated in his talk, "Relationship of Metallurgy and Design", the fact that sharp corners and other points of stress concentration are responsible for a large percentage of failures which occur, although the steel may be high-strength alloy and properly heat treated.

It was shown by slides that the endurance limit of engineering steels at a sharp corner or for high values of stress concentration is little different for alloy and straight carbon steels.

Thread rolling, peening, cold working, or a change in the heat treatment to provide favorable residual stresses will often improve endurance limit. Where products require straightening after heat treating, a stress-relieving treatment after straightening will often cause a more favorable balance of stresses to increase the endurance limit. Dr. Horger also showed slides of typical fractures occurring from points of stress concentration.

Ten Years Ago

Quotes From *Metals Review*
April 1942

"ARDEN L. KNIGHT, past chairman of the Boston Chapter A.S.M. and currently a member of the Executive Committee and a member of the national By-Laws Committee, has been called into active service with the U. S. Navy Bureau of Ordnance as lieutenant commander."

"Until May first—special prepublication saving on new books: Heat Flow in Metals, by J. B. AUSTIN; Hardness and Hardness Measurements, by S. R. WILLIAMS; Controlled Atmospheres—1941 Metal Congress Symposium."

Alloy Developments Discussed

Reported by J. V. McMaster
Metallurgist, General Electric Co.

Recent developments in corrosion and heat resistant alloys were the keynotes of a talk given by J. T. Gow, chief metallurgist for the Electric Steel Foundry Co., Portland, before the February meeting of the Columbia Basin Chapter A.S.M.

In his talk, which he supplemented with slides, Mr. Gow described the history, fabrication, metallurgy, and applications of stainless steel castings. Developments in extra-low-carbon types were also discussed.

Requirements for Aircraft Materials Discussed at Purdue

Reported by J. M. Hoegfeldt
Haynes Stellite Co.

The requirements of aircraft materials and the alloys that serve them were discussed by Richard R. Kennedy, chief of program control, Materials Laboratory, Wright Air Development Center, in a talk entitled "Use of Materials in Aircraft", given before the Jan. 15th meeting of the Purdue Chapter A.S.M.

For structural parts, the aircraft industry must always consider the strength-weight ratio, the design and loading, and the fatigue characteristics of the particular part used. The industry has endeavored to obtain lighter and lighter alloys able to withstand many conditions peculiar to airplanes, including a temperature variance from -65° F. to +1600° F., without sacrificing strength. In this vein, light-weight aircraft parts are usually highly stressed, though failures cannot be tolerated.

Aluminum and its alloys insure the success of the modern airplane by their use both in the frame and in the engine. Duralumin was the first important aluminum alloy, while Type 75 S is now widely used. Many other alloys of aluminum have been developed and found limited use.

Magnesium is just now finding its place in the airplane. It is the lightest commercial structural material and has a fairly high strength-weight ratio. The separation of magnesium from its source, sea water, is relatively inexpensive. As its corrosion re-



At the February Meeting of the Purdue Chapter Are From Left, Glen A. Fritzlen, Haynes Stellite Co., Technical Chairman; Richard R. Kennedy, Wright Air Development Center, Who Spoke on "The Use of Materials in Aircraft"; A. L. Hurst, Aluminum Co. of America, Chapter Chairman; and V. C. Freeman, Assistant Dean, Purdue School of Agriculture, Coffee Speaker. (Photograph by W. F. Bertram, Haynes Stellite Co.)

sistance is improved by protective coatings and by better understanding of its use, more and more applications for magnesium will be found.

Extensive research is being directed towards the development of a high-strength wrought magnesium alloy. Production of a particularly strong zirconium-zinc-aluminum-magnesium alloy by a powder metallurgy method, giving an ultimate strength of 55,000 psi., is now being tried.

High-temperature alloys have come into importance with the use of turbo-superchargers and jet engines. A great deal of work has been done on these alloys to obtain better properties with the use of less strategic metals. For temperatures up to 1100° F., iron-base alloys are most suitable. Up to 1350° F., alloys containing about 50% iron and various critical elements are used. Cobalt or nickel-base alloys are used at 1500° F. and above. Most alloys, when highly

stressed, are unsuitable for service above 1600° F.

Investigations are now concentrated on ceramics, ceramic-metal combinations, and bonded metallic carbides to develop high-temperature parts that will withstand service conditions above 1600° F.

The Materials Laboratory, Mr. Kennedy stated, is also investigating some of the so-called rare metals such as titanium, silicon, pure chromium, vanadium, zirconium, and hafnium. The metallurgy of the aircraft industry is constantly changing, and continuous research is needed to keep abreast with developments.

V. C. Freeman, assistant dean of the Purdue School of Agriculture and Purdue's representative on the Big-10 Athletic Council, gave an interesting coffee talk on Inter-Collegiate Athletics. Glen A. Fritzlen, chief metallurgist at Haynes Stellite Co., served as technical chairman.

Unique Characteristics of Ductile Iron Attributed To the Graphite Form

Reported by Andrew N. Eshman
North American Aviation, Inc.

Ductile iron, a new member of the ferrous engineering alloys, obtains its unique characteristics by having its combined graphitic carbon in the form of nodules rather than in flake form, according to Richard A. Flinn, associate professor of product and metallurgical engineering, University of Michigan, who gave an address before the January meeting of the Columbus Chapter A.S.M.

The above phenomenon occurs, he stated, when cerium or magnesium is introduced into a heat of cast iron that would normally solidify gray. The graphitic carbon in nodular form lends extra strength and toughness to the cast iron. Through proper alloying and treatment given ductile irons, the matrix may be made ferritic, pearlitic, martensitic, acicular, or austenitic.

Depending upon the use of the material, Mr. Flinn continued, various combinations of physical properties may be offered by licensed foundries. Currently, the A.S.T.M. is setting up specifications for various grades of ductile irons, including those having a pearlitic-ferritic matrix and an ausenitic matrix.

The foundry practice for ductile irons has both advantages and disadvantages. Factors on the plus side are that their fluidity is the same as for cast irons, depending upon the amount of superheat above the solidus; their pouring temperature is approximately 300-400° F. under that of steel; and ductile iron castings have no hot tears or cracks. Factors on the negative side are that ductile irons will require different gating and risering practices than those used on ordinary cast irons, and that they are very sensitive to thin sections in the annealed state, although this can be remedied by annealing.

According to Mr. Flinn, the greatest field of competition for ductile iron will be between malleable iron and steel.

New Subsidiary Added

The National Research Corp. has announced the activation of a subsidiary, the Vacuum Metals Corp., with offices and facilities in Cambridge, Mass. This new company will undertake the commercial exploitation of certain of the developments arising from research activities of National Research Corp. in the metallurgy field.

B. C. Site of Ore Dressing Works

Macro (Exploration Division of Kennametal Inc.) Latrobe, Penn., has made plans to build an ore dressing and electric smelting works on Kingsway at Port Coquitlam, British Columbia, on a 20-acre site.

The new material, tungsten ores and concentrates will be obtained, to the extent possible, from sources in British Columbia. Scheelite, hubnerite and wolframite ores and concentrates will be purchased for refining into tungsten carbide.

METAL SHOW NEWS

Dateline: Philadelphia, Oct. 20-24

**A month-by-month
preview of the
National Metal Congress
and Exposition**

April—Metal is the mighty magnet that will draw a record-breaking audience of America's foremost metal engineers, scientists and industrial designers and producers to Philadelphia this Fall.

They'll come by the thousands to see what's new in product, method, and technique at the National Metal Congress and Exposition, Oct. 20-24, in Philadelphia's Convention Halls. Year after year this great "Metal Show" has grown in size and importance until today it is regarded as the "command" performance of American industry. This is clearly established by the fact that all space originally laid out was sold weeks ago. Additional exhibit areas are now being planned.

Exhibitors through the years have learned that the Exposition is a strong sales stimulant with the power to make and close sales on the exhibition hall floor, and to start sales that are completed months later.

Metallurgists, metals engineers, and key production personnel attend the technical sessions of the Congress, its lectures, forums, and special meetings, in search of new knowledge and developments coming out of the nation's top metals laboratories.

The American Society for Metals is the managing sponsor of these significant events, with William H. Eisenman, national secretary, as managing director. A.S.M. headquarters will be in

the Benjamin Franklin Hotel, where most of the technical sessions of the Society will be held. The annual meeting and banquet are also scheduled at the Benjamin Franklin.

Co-sponsors with the American Society for Metals are three national technical organizations, the American Welding Society, the Metals Branch of the American Institute of Mining and Metallurgical Engineers, and the Society for Non-Destructive Testing.

So strong is the lure of the Metal Show that hundreds of firms not exhibiting products or processes regularly send representatives to study and report on competitive products, or to examine carefully the newest developments for possible application to company production methods. There is a marked tendency among top management levels of the nation to visit the Metal Show for firsthand information and objective viewing of what's ahead for the metals industries.

The high quality of the many technical papers so far received by the Publications Committee, with W. M. Baldwin, Jr., as chairman, promises outstanding interest for those attending the technical sessions. A feature of these sessions will be special lecture courses under the direction of Chairman N. J. Grant's Educational Committee. The subjects covered will be "Gases in Metals", co-ordinated by Carl A. Zapffe; "Low-Temperature Properties of Metals" and "Substitution of Alloys".

Weapons Authority Is New Ordnance Librarian

Ancel St. John, scientist, writer and authority on weapons, has recently been appointed staff librarian in the Office of Ordnance Research (OOR) at Duke University.



Ancel St. John

This office acts as an international clearinghouse for basic research of interest to the ordnance corps. Dr. St. John, with a small staff, will keep all the books and documents which pertain to OOR work, and he will also help to maintain a cross-reference section for all OOR projects as well.

For the past four years Dr. St. John has been a member of the Navy Research Section of the Library of Congress. During World War II he served in the Rocket Development Division of the U. S. Chief of Ordnance. He is the author of numerous articles on rockets and jet propulsion for military journals.

Dr. St. John received his Ph. B. degree from the University of Rochester, and his Ph. D. from Clark University. He was an instructor in physics for several years at various colleges and universities before joining government service.

Dr. St. John is a past chairman of the New York Chapter A.S.M.

Eighth Interchapter Meeting Scheduled in Pennsylvania

The six A.S.M. chapters located wholly in Pennsylvania will hold their Eighth Biennial Pennsylvania Interchapter Meeting at Pennsylvania State College, State College, Pa., on Friday, June 20, and Saturday, June 21, under the auspices of the Penn State Chapter. The meeting is open to all who wish to attend.

The technical program which has been arranged will include a feature address by Zay Jefferies on Friday morning on "Metals and Metallurgy of the Future". There will be two simultaneous sessions on Friday afternoon, one on "Conservation of Metals," and the other on the "Relation of Laboratory Tests to Service Conditions." On Saturday morning, there

will be concurrent sessions on "Recent Advances in Steelmaking Practice" and on "Metallurgical Aspects of Casting." Papers by outstanding experts will be presented at each session.

An informal banquet and entertainment on Friday night will highlight the nontechnical part of the program. Provisions are being made for a ladies' program for both days of the meeting.

Hotel reservations may be secured from Prof. H. M. Davis, and program details from Prof. H. J. Read, of the metallurgy division, Pennsylvania State College, State College, Pa.

A complete program of the meeting will be published in the May issue of *Metals Review*.

Ten Years Ago Quotes from *Metals Review* March 1942

"Cincinnati Chapter has announced that the previously cancelled Tri-Chapter Meeting of the Columbus, Dayton, and Cincinnati Chapters has been reinstated. . . The subject of the meeting will be 'Heat Treating and Heat Treating Problems Created by Substitute Materials'."

Corrosion Resistance of Titanium Gives it Place As Major Structural Metal

Reported by W. L. Slosson

*Metallurgical Engineer
Boeing Airplane Co.*

The "wonder" metal titanium is growing up the hard way, but its strength-weight ratio and excellent corrosion resistance will give it a place with the major structural materials. This was the keynote of the technical discussion on titanium presented by John F. Baisch, research engineer, Boeing Airplane Co., before the Puget Sound Chapter A.S.M. February meeting.

Two major factors have influenced the development of titanium, Mr. Baisch pointed out. First, the high cost of research, and second, the difficulty in duplicating laboratory processes in commercial production.

The basic process used in commercial production of titanium involves the reduction of titanium tetrachloride by molten magnesium. The sponge produced is then melted in electric arc furnaces and poured into ingots. Molten titanium absorbs hydrogen, oxygen and nitrogen readily. These gases tend to harden the metal and, except for hydrogen, the reactions are irreversible. Melting in a vacuum or an inert atmosphere is thus a necessity. Molten titanium also reacts with most refractory materials, and contamination from these sources results in sponge of varying compositions.

Because melting sponges of different compositions results in heterogeneous ingots containing hard and soft sections, sponges of similar analysis are selected for a particular melt.

The effects of impurities are apparent in the final form. Varying hardness results in wrinkles and variable thickness. Seams and inclusions may result from sponge impurities and electrode contamination. These factors cause an extremely high rejection rate of mill products, such as sheet and strip, plate, bars, rod, wire and forgings.

Exposure to air should be minimized when parts are worked at high temperatures, Mr. Baisch stated. Temperature is very important in forging, since excessive grain growth occurs at high temperature. Forging should normally be done near the critical temperature, but where heavy reduction is anticipated, a higher forging temperature may be utilized. Grain refinement is accomplished by working alone, and subsequent heat treatment has no effect in reducing grain size. Among the processes presently being investigated are precision casting and extrusion.

Heat treatment of titanium alloys is a complex problem. The condition of the material prior to heat treat-

ment is critical. Time and temperature used will vary, depending on the amount of work previously received by the material, and the temperature at which that work was done. Hardening of titanium alloys is caused principally by decomposition of the beta phase. The factors which influence this decomposition are the alloy content of the transformed beta and the rate of cooling.

M. I. T. Offers Summer Course On Infrared Spectroscopy

A special program in infrared spectroscopy will be given at the Massachusetts Institute of Technology from June 16 to 27 during the 1952 summer session.

The program, to be offered jointly by the spectroscopy laboratory and department of chemistry, is designed for those who wish an introduction to infrared instrumentation and laboratory methods and for those interested in the use of infrared spectra in the solution of chemical problems.

The course will consist of two integrated one-week sessions on the Techniques of Infrared Spectroscopy and on the Applications of Infrared Spectroscopy under the direction of Richard C. Lord, director of the spectroscopy laboratory, M.I.T., and F. A. Miller, in charge of the spectroscopy laboratory at the Mellon Institute of Industrial Research.

Requests for applications should be addressed to Dr. Ernest H. Huntress, Director of the Summer Session, Room 3-107, Massachusetts Institute of Technology, Cambridge 39, Mass.

ASM-AWS Joint Meeting



William Northrup (Left) of Granite City Steel Co. Spoke on "Deep Drawing Cold Rolled Steel Sheets" Before the Joint Meeting of the Wichita Chapters A.S.M. and the American Welding Society in February. Mr. Northrup discussed the various manufacturing phases involved in producing cold rolled steel sheets. Left is C. Mitchell Allen, chapter chairman, A.W.S., and center is Claude Hamilton, chairman of the Wichita Chapter A.S.M. (Reported by R. E. Layton)



Compliments

To WALTER A. DEAN, chief metallurgist for the Cleveland Works of the Aluminum Co. of America, on his election to chairman of the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers.

To WILLIAM W. SIEG, president of the Titan Metal Manufacturing Co., on his selection as the 1952 recipient of the David Ford McFarland Award of Pennsylvania State College. The award, established in 1949 as an annual recognition to a metallurgy alumnus of the College, was based on Mr. Sieg's attainments in the metallurgical industry and his outstanding work in civic affairs.

To R. B. FREEMAN on his promotion from chief metallurgist to assistant to the vice-president of operations at the Columbia-Geneva Steel Division, U. S. Steel Co., San Francisco. Mr. Freeman is a member of the Golden Gate Chapter.

To C. DALE DICKINSON, Allis-Chalmers Manufacturing Co. research engineer, on being awarded an Allis-Chalmers fellowship for 12 months of residence study for a Ph.D. degree in metallurgical engineering. He has enrolled at the University of Michigan.

To WILLIAM E. MAHIN, past chairman of the Chicago Chapter, director of research at Armour Research Foundation of the Illinois Institute of Technology, on being named to the subcommittee on aircraft structural materials of the National Advisory Committee for Aeronautics. He is also consultant to the Minerals and Metals Advisory Board of the National Research Council, and recently was elected chairman of the Chicago section of the American Institute of Mining and Metallurgical Engineers.

To J. W. ARMOUR, manager of manufacturing research at International Harvester Co., on the "President's Citation" presented in the December 1951 issue of *Harvester World*.

To LUTHER A. KLEBER, vice-president in charge of manufacturing, General Steel Castings Corp., and to HAROLD H. JOHNSON, chief metallurgist, National Malleable and Steel Castings Co. (Sharon Plant), on receipt of the annual Steel Foundry Facts Award presented by the Steel Founders' Society of America. The award is made for excellence of material published in the Society's technical publication.

Discusses High-Temperature Alloys



J. J. Heger of U. S. Steel (Left), Technical Chairman of the January Meeting of the Pittsburgh Chapter, Congratulates Howard C. Cross of Battelle Memorial Institute, Principal Speaker of the Evening, on His Effective Talk on the "High-Temperature Properties of Metals"

Reported by D. W. Gunther
Westinghouse Electric Corp.

"High-Temperature Properties of Metals" was the subject of a talk given by Howard C. Cross of Battelle Memorial Institute to the members of the Pittsburgh Chapter A.S.M. during their January meeting.

Mr. Cross's presentation was concerned with four classifications of materials which are being investigated for high-temperature applications. These groups are the titanium alloys, the so-called superalloys, ceramets (or ceramels), and molybdenum and its alloys.

The titanium alloys have been somewhat disappointing, Mr. Cross noted. These alloys exhibit their most satisfactory properties in the range 400 to 800° F., where they compare favorably with aluminum alloys at 300° F. Titanium alloys are being used in place of aluminum and stainless steel on some jet engines in order to obtain service information. In the average jet engine, substitution of titanium results in a weight reduction of 250 pounds.

In the superalloys classification, processing variations are important in affecting the physical properties of the material. The properties of N-155 alloy probably have been more thoroughly investigated than those of any other alloy. The most satisfactory heat treatment for this alloy is a solution treatment at 2200° F., followed by aging at 1400° F. for 22 hr.

Mr. Cross commented generally on the alloy situation. The supply of alloying elements generally is unsatisfactory; cobalt and columbium are the most critical elements today. Composite disks using a ferritic center (lower temperature zone) and an austenitic rim are being used by several American manufacturers. This offers a method of conserving critical alloys without the necessity for incorporating disk cooling schemes into the engine design.

In all the superalloys, the approach to the development of new alloys has been strictly empirical. With the present state of knowledge, it is not possible to predict performance or to specify alloys systems which will give good high-temperature properties.

Ceramics, in themselves, have considerable strength; their weakness lies in their poor thermal shock resistance. A compromise of properties to provide materials with more suitable characteristics has resulted in the ceramets or ceramals. For extremely high temperatures (2000° F.), the ceramet should have a high carbide and low metal content. Properties of K151A with 20% nickel and K152B with 30% nickel (remainder titanium carbide) were compared to show how the larger amount of metal is responsible for the lower strength of K152B.

Molybdenum and its alloys exhibit some remarkable properties. For example, some pure molybdenum is better at 1600° F. than Stellite 31. Its most important failing is lack of oxidation resistance. Coatings such

as molybdenum disilicide, and also alloying of the molybdenum, are being investigated for improvement of oxidation resistance but, to date, results have been unsatisfactory. An outstanding alloy of molybdenum contains 2.4% titanium. Creep tests performed on a sample of this material finally resulted in failure of the specimen holder. This alloy did not recrystallize under heat treatment of 1 hr. at 3200° F.

Mr. Cross emphasized in closing that it is best to tailor alloys to meet all factors involved in a specific application, instead of attempting to provide as much strength as possible at the expense of other properties.

Boston Chapter Completes Popular Lecture Series

Reported by John D. Paine Jr.
United Shoe Machinery Corp.

A series of five lectures on "Heat Treating Methods and Equipment" has been completed by the Boston Chapter A.S.M. Attendance at each meeting averaged 150, with 250 persons turning out for the final meeting. All meetings were held at M.I.T.'s Technology Hall. Subjects of the lectures were:

Atmospheres, by O. E. Cullen, Chief Metallurgist, Surface Combustion Corp.

Salt Baths, by B. D. Carner, Metallurgist and Consultant.

Temperature Controls for Heat Treating Furnaces, by R. R. West, Industry Manager, Brown Instruments Division, Minneapolis Honeywell Regulator Co.

High Frequency Induction Heating, by Joseph F. Libsch, Department of Metallurgy, Lehigh University, and Metallurgical Consultant for Lepel High Frequency Laboratories, New York.

Practical Heat Treatment, by A. Dudley Bach, President, New England Metallurgical Corp., Boston.

W. M. C. Conferee Continues Metallurgical Travels

Howard K. Worner, professor of metallurgy at the University of Melbourne, Australia, has been traveling continuously since leaving the United States where he had attended the World Metallurgical Congress and was a member of Study Group 8 (Metallurgical Education).

He first paid a visit to England where he had conferences with various metallurgical institutes and visited universities carrying out research in fields similar to his own. He continued on to Pakistan, India, and Java on a lecture tour under the auspices of UNESCO. In each of the countries he visited, Mr. Worner was able to make contacts with some of the leading educationalists and exchange viewpoints on modern metallurgical educational methods.

THIRTY YEARS AGO

According to the March 1922 issue of the *Transactions* of the American Society for Steel Treating (early name of the present A.S.M.), FRANCIS B. FOLEY, metallurgist at the Minneapolis Station of the Bureau of Mines (now consulting metallurgist, International Nickel Co., Inc., and an A.S.M. past president), was a popular chapter speaker. During February he addressed both the Washington and Cleveland Chapters, speaking on "The Annealing and Hardening of Steel" and "Industrial Pyrometry" respectively.

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February speaker before the Schenectady Chapter was J. V. EMMONS, then and now with Cleveland Twist Drill Co., and at that time national treasurer of the Society.

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"Commercial Items of Interest" states that "An evening course in metallography has been inaugurated by the Polytechnic Institute, 99 Livingston St., Brooklyn, N. Y." Brooklyn Polytech's metallurgy department has since grown to a point where an active A.S.M. student group was organized a few years ago.

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The April 1922 issue of *Transactions* carries an announcement of the spring regional meeting of the national Society to be held at Pittsburgh on May 25 and 26. Last February's Midwinter Meeting, also in Pittsburgh, was therefore in the nature of a historical repetition.

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W. J. MERTEN* was chairman of the Papers and Meetings Committee for the meeting.

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High spot of the gathering was an address by J. A. MATHEWS,* president, Crucible Steel Co. of America, on "History of Metallography and Heat Treatment of Iron and Steel".

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Another speaker on the program was MARCUS A. GROSSMANN, metallurgist, Electric Alloy Steel Co., Charleroi, Pa. (now director of research, United States Steel Co., Pittsburgh, and a past president of A.S.M.). His subject was "The Change in Dimensions of High Speed Steel in Heat Treatment". Dr. Grossmann's preoccupation with heat treatment has continued through the years, and he is author of the established A.S.M. text on "Principles of Heat Treatment" as well as a new book on "Elements of Hardenability".

* Deceased

"Standing of the Chapters" statistics for the spring of 1922 listed the first six chapters (according to number of members) as follows: Chicago, Detroit, Philadelphia, Cleveland, Pittsburgh, New York.

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One of the first descriptions of magnesium and its alloys as engineering materials appeared 30 years ago in *Transactions*, when a paper appeared on "Dowmetal and Its Applications" by JOHN A. GANN, then and now in the physical and metallurgical research laboratory, Dow Chemical Co.

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Participating in the discussion of properties of the alloys and potential applications were such luminaries as Prof. O. E. HARDER of University of Minnesota (now assistant director of Battelle Memorial Institute, and A.S.M. past president), Prof. H. M. BOYLSTON* of Case School of Applied Science (now known as Case Institute of Technology), and J. L. McCLOUD (now manager of manufacturing research, Ford Motor Co.).

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Philadelphia Chapter was honored at its February meeting by the presence of HARRY BREARLEY* of Sheffield, England (pioneer in the development of stainless steel), who was the guest of T. H. NELSON, general steel works manager of Henry Disston & Sons, Inc. (now consultant—T. Holland Nelson Laboratories).

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This memorable meeting was also addressed by President F. T. GILLIGAN (now secretary-treasurer of Henry Souther Engineering Co.) on "Quality First in Material and Workmanship"; by J. A. MATHEWS*, president of Crucible Steel Co. of America, on "What Is Steel", and by RICHARD SPILLANE, business editor of the Philadelphia *Public Ledger*, on "The Present Status From a Business Standpoint". About 225 members were present.

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"ROBERT C. STANLEY, formerly first vice-president, recently has been elected president of International Nickel Co.," says a news announcement. "A new department of development and research . . . will be under the direction of A. J. WADHAMS as manager. Associated with him will be Dr. PAUL D. MERICA, director of research" (now executive vice-president for International Nickel).

Chipman at Detroit



John Chipman, National President A.S.M., Was the Honored Guest and Speaker When the Detroit Chapter Celebrated National Officers' Night in February. The evening was climaxed by a lecture describing methods used and results obtained from research into the chemical behavior of sulfur during the steelmaking process. Dr. Chipman reported the advancement made in knowledge of the effect of numerous elements and compounds available to steelmakers on the removal of sulfur from molten steel, and described the technique that was used in these studies. (Reported by C. A. Gorton)

Missouri Elects New Officers

Reported by Vernon C. Potter

"New Welding Methods and Alloys for Salvage of Tools and Dies" was the subject of a talk given by R. Groman, regional director of the Eutectic Welding Alloys Corp., before the February meeting of the Missouri School of Mines and Metallurgy Chapter A.S.M.

William Frad was elected chapter faculty advisor, to serve out the term of the previous advisor who has been recalled to the Armed Forces. Vernon C. Potter was elected secretary-treasurer, succeeding Paul G. Barnard, who has resigned.

Boston College Offers Course in Industrial Spectroscopy

Boston College has announced a special two weeks intensive course in modern industrial spectrography at Chestnut Hill, Boston, from July 21 to Aug. 1, 1952.

The course is particularly designed for chemists and physicists from industries in the process of installing spectrographic equipment. Information on the course can be obtained from Prof. James J. Devlin, S. J., physics department, Boston College, Chestnut Hill 67, Mass.

Problems Involved in the Fabrication of Heat and Corrosion Resistant Alloys

Reported by R. W. Chase
A. C. Spark Plug Division

Members of the Saginaw Valley Chapter A.S.M. heard the first-hand story on many of the problems involved in the fabrication of heat and corrosion resistant alloys from Hiram Brown, Solar Aircraft Co.'s chief metallurgist, when he presented his talk on superalloys before the January meeting. Mr. Brown drew on his wide experience in dealing with the practical problems of getting and keeping production rolling on products using alloys containing a high percentage of chromium, nickel, cobalt, and molybdenum.

Often the properties that make a stainless steel a so-called *superalloy* are the same factors that are involved in fabrication difficulties, the speaker pointed out. When a new alloy is perfected, trade literature based on laboratory tests goes out in glowing terms, extolling its desirable properties. However, when the alloy is specified for a job, it is the production men who struggle with the alloy to work out the difficulties associated with its fabrication.

The first signs of trouble usually appear in the receiving inspection departments, in the form of slivers, laminations, and scale pattern in sheet stock, and seams in bar stock, which are characteristic troubles with stainless and heat resistant steels. Other troubles may appear in the form of directional properties on bend and tensile tests. Some heat resistant steels, such as L-605, show such high notch sensitivity and rapid work hardening that test specimens have to be prepared in a special manner. Some steels, such as N-155, are very sensitive to inclusions and stringers, thus causing splits after forming. This, together with control of grain size during annealing, are also problems still to be solved.

After the steels are passed by the laboratory, other difficulties are encountered. For example, two materials may have the same elongation specification but show quite different drawing characteristics in use, and heats of an alloy falling within the chemical limits specified may show considerable variation in weldability. Most stainless alloys have a great affinity for carbon, which means that extreme care has to be taken when gas welding is called for.

Some alloys indicate hot short ranges, evidenced by splitting during annealing operations. And, there are still other pitfalls in annealing or stress-relief heat treatments. Carbide precipitation and consequent embrittlement result in many alloys if

they are not heated and cooled rapidly. Also, if a number of interstage anneals are used, the scale formed by oxidizing atmosphere can excessively reduce section thickness.

Fabricating problems such as machining difficulty and galling during forming are more generally known.

Mr. Brown was not pessimistic, however. He felt that the difficulties associated with the fabrication of high-temperature alloys can be and are being overcome by competent technical men in the metallurgical field.

Annual Ladies' Night at B. C.

Reported by W. J. Chappell
Vivian Engine Works, Ltd.

During the February meeting of the British Columbia Chapter A.S.M., which was also the annual Ladies' Night, the Great Magician, Harry Clayton of Welding Shop and Engineering Co., kept the guests highly entertained with his tricks of magic and wizardry.

A very interesting movie on the manufacturing of steel was shown by Atlas Steel Co., and the meeting was concluded with entertainment and dancing for members and their guests.

American Chain & Cable Adds New Casting Division

American Chain & Cable Co., Inc. has combined its Reading Steel Casting Division and the malleable iron department of the American Chain Division into the ACCO Casting Division.

This new division of the company will be responsible for sales of steel, gray iron and malleable castings.

Recent Developments in Castings Metallurgy

Reported by L. P. Wilson
Chief Metallurgist, U. S. Defense Corp.

"Recent Developments in the Field of Ferrous Castings Metallurgy" were discussed before the February meeting of the St. Louis Chapter A.S.M. by Keith D. Millis, development and research division, International Nickel Co., Inc., New York.

In the discussion of ductile iron, slides were used to show the spheroidal graphite which is characteristic of the material and to demonstrate some of its properties and applications. The spheroidal graphite structure in high-carbon iron is produced by a process, developed by the International Nickel Co., which depends on the introduction and retention of a small but effective amount of magnesium.

As a result of the graphite being in this form, the mechanical properties of the iron are similar to those of common grades of steel and a correlation exists between hardness, tensile strength, and elongation. Stress is proportional to strain within the proportional limit, and the modulus of elasticity is 24,500,000 to 26,000,000 psi. It responds to heat treatment in a manner similar to steel and can be hardened by flame or induction.

The material has excellent machinability, heat resistance, and wear resistance, and in sound castings is outstanding for its pressure tightness. The fatigue properties are comparable to ordinary grades of steel and the material can be welded.

Ductile iron may be melted in a variety of units but is most suited to basic cupola melting because of the high carbons obtainable from high steel charges in this unit. Its fluidity is comparable to gray iron and it is cast in shapes varying from less than 1 oz. to over 50 tons.

"Steel Peddler" in Los Angeles



In His Talk "Reminiscences of a Steel Peddler" (See March Issue, Page 17) E. M. Jorgensen (Center) Gave an Account of His Experiences in the Steel Business to the Members of the Los Angeles Chapter During the January Meeting. With Mr. Jorgensen are, left, W. F. Nash, Jr., chairman, and right, F. L. Stamm, vice-chairman. (Photo by Dave DeRoche)

Rochester Initiates Scholarship Plan



Robert Guinan, Camera Works, Eastman Kodak Co. (Left), Chairman of the Rochester Chapter Educational Committee, Is Shown Releasing the Announcement of the Chapter's New Scholarship Plan to Norman O. Howden, Science Editor of the Gannett Newspapers, while Richard Hendrickson, Bausch & Lomb Optical Co., Chapter Chairman, Looks On

Columbus Lecture Series Is on Metal Machining

Reported by Paul Maynard
North American Aviation Co.

The Educational Committee of the Columbus Chapter A.S.M. is currently offering a series of five lectures which present the fundamentals of metal machining and the application of these fundamentals to plant practice.

The subjects of the lectures are:

Mar. 20—*Physics of Metal Cutting and Cutting Fluids*, by M. E. Merchant, Assistant Director of Research, Cincinnati Milling Machine Co.

Mar. 27—*Carbide Tool Applications*, by W. L. Kennicott, Chief Engineer, Kennametal, Inc.

Apr. 8—*Evaluating Machinability of Forgings and Castings*, by J. F. Kahles, Metcut Research Assoc.

Apr. 15—*Common Problems in Metallurgy and Machinability of Steels*, by W. H. Splinter, Machinability Engineer, Republic Steel Corp.

Apr. 24—*Possible Solutions to New Problems in Machining*, by F. W. Bougler, Supervising Metallurgist in Steel Processing Research, Battelle Memorial Institute.

There is no charge for these lectures, which are held at Battelle Memorial Institute. Members attending all five lectures will be awarded a certificate issued by National Headquarters. Haswell Staehle, Surface Combustion Corp., is chairman of the Educational Committee.

Reported by John J. Hoffer
Metallurgist

Hawk-Eye Works, Eastman Kodak Co.

Careers in metallurgy as well as the A.S.M. will both be effectively brought to the attention of every high-school senior in the Rochester Chapter area through a newly inaugurated scholarship award plan. Announcement of this scholarship was made at the annual joint meeting of the Rochester Chapter A.S.M. and the Industrial Management Council of Rochester in February by Richard C. Hendrickson, chapter chairman. More than 250 men, representing Rochester's varied industries, were present at the meeting.

An award of \$250 will be granted to a student selected by a group of prominent citizens from Rochester's industries for the best paper submitted on the subject "Metallurgy as my Career". All high schools in the area are being contacted and furnished with directions for writing and submitting the paper, posters announcing the award, and a supply of the pamphlet "A Career in Metallurgy" distributed by A.S.M. headquarters.

The Chapter's Educational Committee has prepared a lecture for high-school assembly programs which describes in detail the field of metallurgy and gives interested students an opportunity to ask questions. Robert G. Ulrech, chief metallurgist of the Distillation Products Division, Eastman Kodak Co., will deliver this lecture, according to Robert Guinan,

chairman of the Educational Committee. Other members of this committee are Richard Eisenberg, professor, University of Rochester, Harry J. Green, Jr., Stromberg-Carlson Co., and Gordon B. Cowles, Camera Works, Eastman Kodak Co.

The Rochester Chapter feels that this program, in addition to the general publicity derived therefrom, will result in a higher enrollment in metallurgical curricula, and also that the A.S.M. will benefit through increased membership, improved relationship with educational groups, as well as better cooperation on the part of sustaining members.

According to Chapter plans the amount of the award will be increased to \$400 for next year if ways and means can be found to secure such a sum. Fortunately, the educational grant of \$100 from the National Office will be a large factor in helping to reach this goal.

The speaker of the evening, G. F. Sullivan, managing editor of *Iron Age*, gave an interesting talk about the future of the steel industry.

New Names Added to Quarter-Century Club

The following A.S.M. members have been awarded honorary certificates commemorating 25 years' consecutive membership in the Society.

Boston Chapter—Olof L. Lorentzon, Bethlehem Steel Co., Boston Gear Works, Inc., Fellows Gear Shaper Co., and Industrial Steels, Inc.—sustaining members.

Milwaukee Chapter—John J. Chyle, Herman C. Frentzel, F. L. MacNamara.

Rochester Chapter—Clifford M. Sears, R. C. Neal Co., Bausch & Lomb Optical Co., Ritter Co., Inc., Rochester Steel Treating Works, Rochester Gas & Electric Corp., Taylor Instrument Co., and Gleason Works—sustaining members.

Kaiser Plans Expansion Program

A \$65,000,000 expansion program that will increase Kaiser Steel Corp.'s pig iron output by 50% and raise steel ingot production by more than 11% has been announced.

New facilities will consist of a third blast furnace to smelt 428,000 tons of pig iron per year, a ninth open hearth steelmaking furnace to add 156,000 tons of steel ingots annually to the Fontana production, 90 additional by-product coke ovens to turn out 408,000 tons of coke per year for use in the blast furnaces, two additional stands in the present hot strip mill, to enable it to roll and finish sheet of lighter gages and greater widths, and major additions to equipment and housing at company-owned iron ore and coal mines.

IMPORTANT MEETINGS for May

May 1-2—Society of Naval Architects and Marine Engineers. Spring Meeting, Roosevelt Hotel, New Orleans, La. (W. N. Landers, Secretary, S.N.A.N.E., 29 West 39th St., New York 18, N. Y.)

May 1-7—American Foundrymen's Society. International Foundry Congress and Show, Convention Hall, Atlantic City, N. J. (William W. Maloney, Secretary-Treasurer, A.F.S., 616 South Michigan Ave., Chicago 5, Ill.)

May 4-8—Electrochemical Society, Inc. Benjamin Franklin Hotel, Philadelphia, Pa. (H. B. Linford, Secretary, 235 West 102 St., New York 25, N. Y.)

May 5-6—National Air Pollution Symposium. Huntington Hotel, Pasadena, Calif. (A. M. Zarem, Chairman, N.A.P.S., Room 332, 612 South Flower St., Los Angeles, Calif.)

May 5-7—Engineering Institute of Canada. Vancouver Hotel, Vancouver, B.C. (L. Austin Wright, Secretary, E.I.C., 2050 Mansfield St., Montreal 2, P.Q., Can.)

May 6-9—Scientific Apparatus Makers Association. Annual Meeting of All Sections, Edgewater Beach Hotel, Chicago, Ill. (Kenneth Andersen, Executive Vice-President, S.A.M.A., 20 North Wacker Drive, Chicago 6, Ill.)

May 8-9—Wire Association. Pittsburgh Regional Meeting, William Penn Hotel, Pittsburgh, Pa. (Richard E. Brown, Secretary, W.A., Stamford Trust Co. Bldg., 300 Main St., Stamford, Conn.)

May 8-10—American Institute of Mining and Metallurgical Engineers. 1952 Pacific Northwest Joint Conference, Davenport Hotel, Spokane, Wash. (Ernest Kirkendall, Secretary, A.I.M.E., Metals Division, 29 West 39th St., New York 17, N. Y.)

May 11-14—American Institute of Chemical Engineers. French Lick Springs Hotel, French Lick, Ind. (S. L. Tyler, Executive Secretary, A.I.Ch.E., 120 East 41st St., New York 17, N. Y.)

May 14-16—Society for Experimental Stress Analysis. National Meeting, Hotel Lincoln, Indianapolis, Ind. (W. V. Covert, Chairman, S.E.S.A. Meetings Committee, c/o Diamond Chain Co., Inc., Indianapolis, Ind.)

May 13—American Association of Spectrographers. Symposium on Instrumental Methods of Analysis in the Nonferrous Industry, Society of Western Engineers Bldg., 84 East Randolph St., Chicago, Ill. (Robert Raisig, Chairman of Symposium Committee, A.A.S., c/o Apex Smelting Co., 2537 West Taylor St., Chicago 12, Ill.)

May 19-20—American Steel Warehouse Association, Inc. 47th Annual Meeting, Waldorf-Astoria Hotel, New York. (Walter S. Dowsy, President, 442 Terminal Tower, Cleveland 13, Ohio.)

Indianapolis Hears E. A. Hoffman



Elbert A. Hoffman, Manager of Metallurgical Sales, LaSalle Steel Co., Discusses His Talk on the Machining of Metals (Previously Reported) With Members of the Indianapolis Chapter at Their January Meeting

Metallurgy as Applied To Design Problems

Reported by A. F. Mohri
Chief Metallurgist
Steel Co. of Canada, Ltd.

"Application of Metallurgical Principles to Product Design" was the subject of a talk presented at the February meeting of the Ontario Chapter A.S.M. by H. Thomasson, manager, metallurgical and mechanical section, research and development laboratories, Canadian Westinghouse Ltd. Mr. Thomasson is a former secretary-treasurer and chairman of the Ontario Chapter. The speaker divided his talk into two distinct subjects.

In the field of production, he exemplified his belief in the application of fundamental metallurgical principles on several problems en-

countered by his staff. Each problem varied in its nature. A working knowledge of chemistry, metallography, heat treatment, welding, and production technique enabled his laboratory to overcome many difficulties and bring them to a satisfactory conclusion. In the elimination of these problems, Mr. Thomasson pointed out that his laboratory is a definite asset to management, productivity being a basic necessity in any company.

Mr. Thomasson dealt at length with the problems presented in design. He described a unique method of nondestructive testing by which stresses and strains can be realized visually. The equipment is in nature simple, consisting of a projection lantern, two polaroid disks, and apparatus to place a strain on the test. The image is visible on the screen and when a load is applied to the test by diffraction of the light, spectrum lines indicate the position of greatest stress. Examples given by the speaker were stresses shown by circular and rectangular holes, lines of stress in a weld, in a crane hook, and in beam and nut design.

May 21-22—American Iron and Steel Institute. 60th General Meeting, Waldorf-Astoria Hotel, New York. (George S. Rose, Secretary, A.I.S.I., 350 Fifth Ave., New York 1, N. Y.)

May 21-23—Gas Appliance Manufacturers Association. Annual Meeting, The Broadmoor, Colorado Springs, Colo. (H. Leigh Whitelaw, Managing Director, G.A.M.A., 60 East 42nd St., New York 17, N. Y.)

May 22-23—Society for Applied Spectroscopy. Seventh Annual Meeting, Hotel McAlpin, New York, N. Y. (C. A. Jedlicka, Secretary, S.A.S., c/o Lucius Pitkin, Inc., 47 Fulton St., New York 7, N. Y.)

May 26-29—Special Libraries Association. 43rd Annual Convention, Hotel Statler, New York, N. Y. (Ruth M. Crawford, Chairman, Convention Committee, S.L.A., 31 East 10th St., New York 3, N. Y.)

Australians to Hold Congress

The Australasian Institution of Mining and Metallurgy (Inc.) extends to all A.S.M. members a cordial invitation to attend the Fifth Empire Mining and Metallurgical Congress in Australia in April and May 1953. The object of this Congress will be to meet and discuss technical progress and problems, and developments of the mineral resources of the British Commonwealth of Nations.

For further information write to the Secretary, Australasian Institution of Mining and Metallurgy (Inc.), Osborn House, 399 Little Collins St., Melbourne, Victoria, Australia.



CHAPTER MEETING CALENDAR



CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Baltimore	May 19	Engineers Club	Ralph L. Lee	Metallurgy—Man to Man
Boston	May 2	Hotel Shelton	Zay Jeffries	Metallurgy in This Emergency
Buffalo	May 8	Bethlehem Supervisors Club		Annual Meeting—Election of Officers
Calumet	May 13	Phil Smidt & Son Whiting, Ind.	R. S. Burns	Rolling and Drawing of Sheet Steel
Cedar Rapids	May 15	Roosevelt Hotel		Annual Meeting—Election of Officers
Chicago	May 12			Ladies Night
Cincinnati	May 8			Annual Election Meeting
Cleveland	May 5	Hotel Hollenden	J. J. Nassau	Beyond the Stars (Ladies Night)
Columbus	May 7	Broad St. Church of Christ	C. P. McShane	Tool Steels (Annual Election)
Dayton	May 14	Engineers Club	A. L. Fields	Precipitation Hardening of Stainless Steel
Detroit	May 12		H. W. McQuaid	Old Timers' Night
	June			Annual Stag Party
Eastern New York	May 12	Circle Inn		Annual Meeting
Hartford	May 13	The Hedges	E. L. Wood	Castings for Small Arms
	June 10			Past Chairmen's Night
				Annual Spring Outing
Indianapolis	May 19	McClarney's Restaurant	R. D. Chapman	Tempering Substitute Steels
Lehigh Valley	May 2	Lehigh Valley Club Allentown		Annual Dinner Dance
Los Angeles	May	Rodger Young Audit.		Election of Officers' Night
Louisville	May 6	Kapfhammer's Party House		Election of Officers
				Ladies Night
Mahoning Valley	May 13			Plant Visitation
Milwaukee	May 9	North Hills Country Club		Annual Party
Minnesota	May 15	Covered Wagon	Otto R. Hills	Springs
School of Mines	May 14			
Montreal	May 5	Spanish Room Queens Hotel		Ladies Night
				Past Chairmen's Night
Muncie	May 13			Ladies Night
New Haven	May 15	Actors Colony Inn, Seymour	J. O. Almen	Fatigue—Loss and Gain by Electroplating
New Jersey	May 19	Essex House	R. E. Zimmerman	The Steel Industry in the East
New York	May 12	Schwartz Restaurant	J. C. McDonald	Current Developments in Magnesium Techniques and Metallurgy
Northern Ontario	May 21	Windsor Hotel	N. Rehder	New Developments in Cast Iron and Foundry Practice
Notre Dame	May 14		F. K. Landgraf	Fractography
Ontario	May 2	Royal York Hotel	O. J. Horger	Fatigue Analysis and Photoelastic Studies
Ottawa Valley	May 6			Ladies Night
Peoria	May 12	American Legion Building	A. O. Schmidt	Heat in Metal Cutting
Philadelphia	May 8	Engineers Club	John Chipman	The Chemistry of Molten Steel (Student's Night)
Pittsburgh	May 8	Roosevelt Hotel	M. F. Garwood	Service Failures of Automotive Parts and Their Relationship to Fatigue
Purdue	May 13		William Kaiser	Making Golf Clubs
Rhode Island	May 7	University of Rhode Island	John Chipman	Steelmaking
Rochester	May 12			Election of Officers
				Annual Meeting
Rockford	May 28		T. B. Jefferson	Welding
Rocky Mountain (Pueblo)	May 15			
(Denver)	May 16		R. O. Mueller	Metallurgical Problems Encountered in Atom Energy
Saginaw Valley	May 10			First Annual A.S.M. Dinner Dance
Southern Tier	May 12	Iron Kettle Inn, Waverly, N. Y.		Ductile Iron (Cornell Student Group)
Springfield	May 9	Hotel Kimball		New England Regional Meeting
St. Louis	May 16	Forest Park Hotel	O. E. Cullen	Gas Carburizing and Carbon Nitriding
	June 7	Mollerus Grove		Annual Stag Picnic
Syracuse	May 17	Hinerwadels Grove		Annual Clambake
Terre Haute	May 5			Heat Treating
				Annual Business Meeting
Texas	May 6	To Be Announced	Ralph A. Clark	Cast Iron

Toledo	May 8	Maumee River Yacht Club	E. G. deCoriolis	Recent Developments in Heat Treating
Tri-City	May 6		Horace Grover	Gas Versus Induction in Heat Treatment of Steel
Tulsa	May 12		J. E. Dato	Welding the Unusual Metals
Utah	June 12			Smoker
Washington	May 22	Kennecott Electrolytic Refinery, Garfield		Plant Visit
West Michigan	May 12			Officers' Night
York	May 19		R. L. Wilson	Recent Developments in Jet Engine Alloys
	June 7	Allenberry Playhouse Boiling Springs, Pa.		

Diffusion Mechanism Illustrated by Slides In Metal Sintering

Reported by Herbert S. Kalish
Sylvania Electric Products Inc.

Members who attended the January meeting of the New York Chapter A.S.M. came away with a better understanding of the diffusion mechanism and the way it operates in the sintering of metals. The speaker, Ben H. Alexander, engineering manager of the Electronics Division, Sylvania Electric Products Inc., Boston, revolved his talk around some 30 slides which showed how like metals and dissimilar metals sinter.

Dr. Alexander based his talk on experiments performed at the Sylvania Metallurgical Laboratories, Bayside, N. Y. These experiments were performed by wrapping wires of metals around a metal core and then studying the diffusion which occurred between the wires or the wire and the core. The cross section of the wires wrapped around the core acts the same as a powder compact considered in two dimensions.

Grain boundaries are important in sintering, a fact that is often overlooked. Densification will sometimes be more complete after sintering for a long time at a relatively low temperature than after a similar time at a higher temperature, because of the rapid grain growth which takes place at the higher temperature. This occurs because there are many vacant atom sites present where there are grain boundaries, whereas a metal with few grain boundaries has fewer holes for atom movement. If there are fewer grain boundaries present, virtually no further densification can be expected for any sintering time, even at temperatures close to the melting point. This indicates the effectiveness of coining after initial sintering where subsequent sintering can result in recrystallization of large grains and promote further densification.

The slow densification of compacts of mixed metal powders can frequently be attributed to the fact that one metal diffuses into the second with relatively little diffusion in the other direction. This causes particles of

the first metal to swell and frequently results in an expansion of the compact rather than densification during sintering. Gold-copper was used to illustrate this phenomenon.

When such an effect occurs in sintering, it is advantageous to pre-alloy the metal powder, if the alloy is to be fabricated by powder metallurgy methods.



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(15) APRIL, 1952

A. S. M. Review of Current Metal Literature

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio

W. W. Howell, Technical Abstractor

Assisted by Janet Motyka, Maxine Runkle and Members of the Translation Group

An Annotated Survey of Engineering,
Scientific and Industrial Journals
and Books Here and Abroad,
Received During the Past Month

A GENERAL METALLURGICAL

95-A. Metals in Review. M. A. Kriz. *Engineering and Mining Journal*, v. 153, Feb. 1952, p. 74-102.

A survey of economic developments and trends of the past year: "Gold," M. A. Kriz; "Silver," Dickson H. Leavens; "Copper," H. H. Wanders; "Lead," Robert L. Zeigfeld; "Zinc," Charles R. Ince; "Tin," H. H. Wanders; "Aluminum," O. C. Schmedeman; "Magnesium," J. D. Hanawalt; "Uranium," Alvin W. Knoerr; "Minor Metals," Charles White Merrill; "Antimony," Abbott Renick; "Arsenic," Abbott Renick; "Beryllium," Stanley Needleman; "Bismuth," Abbott Renick; "Cadmium," Robert L. Mentch; "Mercury," Helena M. Meyer; "Platinum-Group Metals," James E. Bell; "Titanium," Frank J. Cservenyak; "Ferro-Alloy Metals," Robert H. Ridgway; "Chromite," Norwood B. Melcher and John Hozik; "Cobalt," Hubert W. Davis; "Nickel," Hubert W. Davis; "Tungsten," Robert W. Geehan; "Manganese," Norwood B. Melcher and E. J. Gealy; and "Molybdenum," Robert W. Geehan. (A4)

96-A. Foundrymen Note New Capital Outlays for Production of Ductile Iron. *Inco Magazine*, v. 25, Winter, 1951-52, p. 9-10, 29.

Utility of ductile iron, its advantageous properties and versatility. (A4, E11, Q, general, CI)

97-A. Growth of the Magnesium Industry. J. D. Hanawalt. *Magazine of Magnesium*, Feb. 1952, p. 10-13.

A survey. Growth curves are presented. (A4, Mg)

98-A. The Combustion Gas Turbine—A New Tool for the Power Engineer. Part II. W. B. Wilson. *Blast Furnace and Steel Plant*, v. 40, Feb. 1952, p. 226-227.

Advantages of the combustion gas turbine in the steel industry. Compares gas-turbine and steam-turbine plants. (A5, Fe, ST)

99-A. Investment Growth in the Iron and Steel Industry. *Canadian Metals*, v. 15, Feb. 1952, p. 8-9.

A survey of investment, plant expansion, employment, and profits during the period 1926-1950 as shown in the Federal Government's study of investments in Canada. (A4, Fe, ST)

100-A. New Plants and Facilities Underway in 1951. A Partial Listing of U. S. Plants and Facilities—in or Related to the Chemical Process Industries—Either Planned, Under Construction, or Completed During 1951. *Chemical Engineering*, v. 59, Feb. 1952, p. 175-185.

METALS REVIEW (16)

Includes metal-production facilities. (A4)

101-A. India's Iron and Steel Industry. *Journal of Metals*, v. 4, Mar. 1952, p. 252.

The present status and expected future developments. (A4, Fe, ST)

102-A. Zinc and Lead. Otto Herres. *Mining Congress Journal*, v. 38, Feb. 1952, p. 59-61, 80.

An economic review.

(A4, B general, Zn, Pb)

103-A. Copper. Tom Lyon. *Mining Congress Journal*, v. 38, Feb. 1952, p. 77.

Reviews the Cu situation with respect to supply, demand, expansion and cost.

(A4, B general, Cu)

104-A. Tungsten, Mercury, and Chrome. Ira B. Joralemon. *Mining Congress Journal*, v. 38, Feb. 1952, p. 78-80.

An economic review.

(A4, B general, W, Hg, Cr)

105-A. Antimony. James P. Bradley. *Mining Congress Journal*, v. 38, Feb. 1952, p. 80.

Supply and demand situation.

(A4, B general, Sb)

The coding symbols at the
end of the abstracts refer to the
ASM-SLA Metallurgical Literature
Classification. For details
write to the American Society
for Metals, 7301 Euclid Ave.,
Cleveland 3, Ohio.

106-A. Aluminum and Magnesium. Lawrence Litchfield, Jr. *Mining Congress Journal*, v. 38, Feb. 1952, p. 86-87.

An economic review.

(A4, B general, Al, Mg)

107-A. Iron Ore. R. T. Elstad. *Mining Congress Journal*, v. 38, Feb. 1952, p. 88-89.

An economic review.

(A4, B general, Fe)

108-A. The Domestic Manganese Picture. Arthur Linforth. *Mining Congress Journal*, v. 38, Feb. 1952, p. 104-106.

(A4, Mn)

109-A. Silver Developments in 1951; Tight Supply Plus Increased Demand Will Force Rise in Ceiling Price. Pat McCarran. *Mining Congress Journal*, v. 38, Feb. 1952, p. 107-108, 123.

(A4, Ag)

110-A. Gold; Long Range Outlook Brighter Despite Decreased World Production and Inflation. Robert W. Bachelor. *Mining Congress Journal*, v. 38, Feb. 1952, p. 109-110, 127.

Surveys the economic situation.

(A4, Au)

111-A. Iron and Steel Scrap. James E. Larkin. *Mining Congress Journal*, v. 38, Feb. 1952, p. 115-116.

Surveys the ferrous scrap situation. (A8, Fe)

112-A. Nonferrous Scrap Metals. Archie J. McDermid. *Mining Congress Journal*, v. 38, Feb. 1952, p. 117-118.

An economic survey. (A8, EG-a)

113-A. The Current World Lead Situation. Future Trends Dependent on International Political Developments. R. L. Wilcox. *South African Mining and Engineering Journal*, v. 62, Aug. 18, 1952, p. 1037, 1039, 1041.

Reviews the over-all production and consumption of Pb in 1950, as a means of better appraising and evaluating the current and likely immediate future situation.

(A4, Pb)

114-A. Toned-Down Noise Tunes up Operations. Charles E. Crede. *Steel*, v. 130, Feb. 25, 1952, p. 76-77. (A condensation.)

Factors contributing to the noise level in metalworking. A few ways to combat this problem.

(A5, F general, G general)

115-A. Metals for a New Kind of World. *Business Week*, Mar. 1, 1952, p. 19-20.

The expansion program planned for Al, Cu, Pb and Zn.

(A4, Al, Cu, Pb, Zn)

116-A. How Stoves and Ranges Are Made in the Pacific Northwest. Howard E. Jackson. *Finish*, v. 9, Mar. 1952, p. 25-28, 57.

Fabrication, finishing, welding, and assembly operations for production of appliances at Pacific Stove & Foundry Co., Seattle, Wash. Parts are fabricated from gray cast iron. (A5, T10, CI)

117-A. Dollar-Sign Engineering. L. D. Miles. *General Electric Review*, v. 55, Mar. 1952, p. 58-59.

Four years ago General Electric's purchasing department undertook a new project on the basic value of every part, every item, of a piece of apparatus. Some of the questions raised were: What does the item do? How important is it in relation to the other parts? Can we eliminate it or simplify it? Can we replace it with a standard? Can it be combined with another part? Can it be made from some other material at a lower cost—and better value? Outlines ten tests of value which are applied. Includes three case histories in parts fabrication. (A4, G general)

118-A. The Iron and Steel Industry in India. John E. Brush. *Geographical Review*, v. 42, Jan. 1952, p. 37-55.

An extensive economic survey. 48 ref. (A4, Fe, ST)

119-A. Salvage Plan Reuses 78 Pct of Scrap Carbide. W. M. Halliday. *Iron Age*, v. 169, Mar. 6, 1952, p. 208-210.

Utilization and application of scrap carbide. (A8, C-n)

120-A. Some Recent Advances in Metallurgy. G. P. Contractor and B. S. Sreekantiah. *Journal of Scientific & Industrial Research*, v. 11A, Jan. 1952, p. 20-23.

25 references. (A general, Fe, ST)

121-A. Utilization of Byproducts and Waste Products of the Fatty Oil Industry. Part I. Recovery of Nickel From Spent Nickel Catalyst. G. K. Belekari, J. G. Kane, and H. S. Shahani. *Journal of Scientific & Industrial Research*, v. 11B, Jan. 1952, p. 28-30.

Samples of spent Ni catalyst from different factories were analyzed and a method for the recovery of Ni by digesting the spent catalyst with $H_2SO_4-HNO_3$ mixtures developed. A recovery of 93-98% is reported. 27 ref. (A8, Ni)

122-A. Claims Copper Shortage not Permanent and It May End Sooner Than Govt. Officials Predict. Simon D. Strauss. *Metals*, v. 22, Feb. 1952, p. 7-8, 19.

(A4, Cu)

123-A. Urges Decontrol of Prices on Lead and Zinc; Attributes Metal Shortages to Govt. Ceilings. Felix Edgar Wormser. *Metals*, v. 22, Feb. 1952, p. 9-10, 17, 19.

(A4, Pb, Zn)

124-A. Metallurgical Fume and Flue Dusts. C. C. Downie. *Mining Magazine*, v. 86, Feb. 1952, p. 80-83.

Methods of handling fume and flue dust at large metallurgical works. The recovery of Se and Te. (A8, B general, Se, Te)

125-A. Aluminum—Today and Tomorrow. Irving Lipkowitz. *Modern Metals*, v. 8, Feb. 1952, p. 25-27.

Surveys production of Al in the U. S. Advantages for the increasing use of this material had future expected markets. (A4, T general, Al)

126-A. Waste Treatment Layout for a Job Plating Shop; A Case History. Leslie E. Lancy, and H. F. Hanson. *Plating*, v. 39, Mar. 1952, p. 250-254.

(A8, L17)

127-A. Recovery of Chromic Acid From Plating Operations. F. R. Keller, C. C. Cupps, and R. E. Shaw. *Sewage and Industrial Wastes*, v. 24, Feb. 1952, p. 202-206; disc., p. 206.

Installation of a recovery system at Standard Steel Spring Co., Newton Falls, Ohio. Flow diagram shows plating cycle as altered to recover chromic acid, showing designed flow rates and equilibrium concentration of CrO_3 . (A8, L17)

128-A. The Plating Wastes Problem From the Electroplater's Viewpoint. A. K. Graham and H. L. Pinkerton. *Sewage and Industrial Wastes*, v. 24, Feb. 1952, p. 207-210; disc., p. 210-211.

An attempt is made to define the electroplating industry and the nature of plating wastes. A distinction is made between plants discharging waste into public waters and into municipal sewers. The interdependence of the sanitary engineer and electroplating engineer, for successful handling of plating waste problems. (A8, L17)

129-A. The Scarcity of Some Important Metals and Possibilities of Coping With It. (In Dutch.) E. M. H. Lips. *Metalen*, v. 6, Nov. 30, 1951, p. 422-427.

Aspects of structural steel, stainless steel, use of scrap, high speed steel, and nodular cast iron. Data are tabulated and charted. (A general, ST, Cl)

130-A. The Importance to Engineers of a Knowledge of Materials. (In German.) Werner Koster. *Zeitschrift des Vereines Deutscher Ingenieure*, v. 94, Feb. 1, 1952, p. 89-94.

The basic knowledge of metallurgy which an engineer should be acquainted with. Graphs and photomicrographs. (A3)

131-A. (Book) Machine and Tool Blue Book. 1952 Directory. 450 pages.

1951. Hitchcock Publishing Co., 222 E. Willow Ave., Wheaton, Ill.

Sources of supply for the metal-working industry. (A10)

132-A. (Book) Operational Research; Its Application to Peace-Time Industry. 151 pages. 1949-1950. Manchester Joint Research Council, Manchester, England.

Means by which an understanding of scientific facts can best be conveyed to the world of industry. Preface, introduction, papers by five research directors, open forum, and a brief bibliography. (A9, A3)

133-A. (Book) The Wealth of India. Industrial Products. Vol. II. Part II. B. N. Sastri, editor. 251 pages. 1951. Government of India Press, New Delhi.

Industrial products of India, whose names begin with the letter "C". Includes both technical and economic information. Numerous illustrations and tables. (A general)

B

RAW MATERIALS AND ORE PREPARATION

97-B. Taconite Plants, New Processes Come First in Iron Ore Plans. L. A. Roe. *Engineering and Mining Journal*, v. 153, Feb. 1952, p. 125-127.

Research and development programs for beneficiating iron ore by flotation, magnetic separation, gravity concentration, heavy-media separation, plus new ideas for metallurgical treatment of iron ores. (B14, Fe)

98-B. Cyclones Set Pace in Milling. *Engineering and Mining Journal*, v. 153, Feb. 1952, p. 128-130.

Usefulness of cyclone in desliming and other classification jobs. Flow-sheet illustrates use of cyclones for selective grinding. Other significant developments in milling and concentration of ores. (B13, B14)

99-B. Development in Nonferrous Metallurgy. A. W. Schlechten. *Engineering and Mining Journal*, v. 153, Feb. 1952, p. 131-133.

New leaching techniques for Ni and Co; a new electrothermic process for Zn recovery; and new production techniques for Ti. (B14, C21, Ni, Co, Zn, Ti)

100-B. Review of Cobalt Metal Production—Notes on Literature. John H. Dismant. *Mines Magazine*, v. 62, Jan. 1952, p. 21-23, 44.

Includes uses in the ceramic and metallurgical industries as well as processes for the recovery of Co from roasted pyrites. (B15, C general, T general, Co)

101-B. Types of Charges and Their Effects on Production Rates. A. R. Altman and Edward Walkowski. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 120-125; disc., p. 125-127.

System followed by the Heppenstall Co. in connection with scrap compositions for the openhearth. Data on 20 groups of 50 heats each. Tables and graphs. (B22, D2, ST)

102-B. Quality of Silica Brick. W. S. Debenham and G. R. Eusner. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 129-138; disc., p. 139-141.

Results of an investigation. Tests were conducted with controlled atmospheres and temperatures. (B19)

103-B. Preparation of Scrap. W. H. Steinheider. *Proceedings, National*

Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers, v. 34, 1951, p. 273-275; disc., p. 275-280.

To set up a basis for better ferrous scrap preparation, some investigation done by the Sheffield Steel Corp., Kansas City, indicates the influence of charging rates on heat times. Data are tabulated. (B22, D2, ST)

104-B. Microstructure in Iron-Ore Pellets. Strathmore R. B. Cooke and T. E. Ban. *University of Minnesota, "Twelfth Annual Mining Symposium,"* 1951, 26 pages.

Study of the microstructures occurring in the fired pellets produced in the laboratory and on a pilot-plant scale. Numerous micrographs. 11 ref. (B16, Fe)

105-B. The Cyclone as a Separating Tool; Its Use in Mineral Dressing. *Chemical Age*, v. 68, Feb. 16, 1952, p. 275-277. (Condensed from paper by K. A. Fern.)

Principles of operation and variables which effect the process. (B14)

106-B. Fine-Size, Close-Specific-Gravity Solid Separation With the Liquid-Solid Cyclone. J. J. Moder and D. A. Dahlstrom. *Chemical Engineering Progress (Engineering Section)*, v. 48, Feb. 1952, p. 75-88.

Demonstrates the above. Design of liquid-solid cyclones for optimum solids separation. The necessary recommendations and equations are presented to construct cyclones for any separation problem. Effects of particle size, gravity difference between solid and liquid, and distribution of the feed slurry to the overflow and underflow streams. Predicted results based on the experimental conclusions are compared with actual cyclone achievements on an industrial material. 12 ref. (B14)

107-B. Experimental Furnace Recovers Manganese From Slag. R. C. Buehl. *Iron Age*, v. 169, Feb. 28, 1952, p. 97-99.

From slag containing from 2.5-11.5% Mn, about 6 out of every 10 lb. of this critical steel ingredient was recovered. The resulting Fe-Mn metal, 56-63% Mn, is suitable for production of ferromanganese. Iron yield may offset much of process's cost so that it can compete with foreign ores. (B21, A8, Mn, Fe-n)

108-B. Mineral Dressing; Need to Approach Self Sufficiency Spurs Construction of New Plants and Research Toward Lower Cost Beneficiation. Nathaniel Arbiter. *Mining Congress Journal*, v. 38, Feb. 1952, p. 52-54. (B14)

109-B. Uranium; Exploration Discloses New Deposits in Hitherto Unsuspected Host Rocks as Mining Activity Increases. *Mining Congress Journal*, v. 38, Feb. 1952, p. 128-130. (B10, U)

110-B. Bagdad Expands Copper Mill—Recovers By-Product Molybdenite—Ups Copper Recovery by pH Control. *Mining World*, v. 14, Mar. 1952, p. 30-33.

Flotation practices for Cu at the Bagdad Copper Corp., Arizona. Mo recovery process. Flowsheet. (B14, Cu, Mo)

111-B. Round-Up on Titanium. III. The Problems of Extraction and Fabrication. N. P. Harvey. *South African Mining and Engineering Journal*, v. 62, Jan. 5, 1952, p. 813, 815.

Some processes of extraction and production. Powder-metallurgy methods of consolidation. (B general, C general, H general, Ti)

112-B. Fundamental Investigation of Steel Plant Refractories Problem. Part I. Phase Relations in the System $2CaO \cdot SiO_2 - CaO \cdot SiO_2 - 2CaO \cdot Al_2O_3 - SiO_2 - FeO$. Arnulf Muan. *Industrial Heating*, v. 19, Feb. 1952, p. 317-318, 320.

Previously abstracted from Amer-

ican Iron and Steel Institute, Preprint, 1951. See item 165-B, 1951. (B19, D general, ST)

113-B. Copper as a Contaminant in Openhearth Steel. (In German.) Georg Rockrohr. *Stahl und Eisen*, v. 72, Jan. 31, 1952, p. 118-122.

Surveys the Cu content of scrap and openhearth pig iron from 1926 to 1950 in Germany. A method for the determination of Cu in steel. (B22, D2, S11, ST)

114-B. Research on the Possibility of Using Float-and-Sink and Sedimentation Processes in the Beneficiation of Siefgländer Siderite. (In German.) Hubert Gleichmann. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 5, Jan. 1952, p. 1-8.

Experimental results show that process can be successfully applied when the grain sizes of siderite range from 100 to 0.25 mm. in diam. Diagrams, tables, and graphs. (B14, Fe)

115-B. Flotability of Various Grain Sizes Depending on the Consistency of the Flotation Suspension. (In Russian.) V. I. Klassen and R. Z. Erenburg. *Doklady Akademii Nauk SSSR*, new ser., v. 74, Aug. 11, 1951, p. 855-857.

Investigated over a considerable range of particle sizes and densities of the suspension. Data are charted. (B14)

116-B. (Book) Mellor's Modern Inorganic Chemistry. G. D. Parkes. 967 pages. 1951. Longmans, Green and Co., 55 Fifth Ave., New York 3, N. Y.

Includes sections on sources of metals, occurrence of ores, and methods used for their preliminary treatment, and a summary of the various types of metallurgical processes in use, with examples indicating the principles on which the choice of method for any particular metal depends. (B general)

117-B. (Book) The Wealth of India. Raw Materials. Vol. II. Part 1. E. N. Sastri, editor. 427 pages. 1950. Government of India Press, New Delhi.

Indigenous plants and natural resources of India, whose names begin with the letter "C". Numerous illustrations. Includes tabular and graphical data on production, imports, exports, etc. (B10, A4)

C NONFERROUS EXTRACTION AND REFINING

37-C. Chemistry of Columbium and Tantalum. VIII. The $\text{Cb}_2\text{O}_5\text{-Ta}_2\text{O}_5\text{-Cb}_2\text{O}_3\text{-Ta}_2\text{O}_3\text{-H}_2\text{O-H}_2$ System. (In German.) Harald Schäfer and Gunther Breil. *Zeitschrift für anorganische und allgemeine Chemie*, v. 267, Jan. 1952, p. 265-276.

Arrangement and experimental procedure for determining reducibility of Cb_2O_5 and Ta_2O_5 (and mixtures of the two oxides) in a stream of H_2 plus water vapor at 900° C. Data are charted. 28 ref. (C2, Cb, Ta)

39-C. Kaiser Chalmette in Production. *Light Metal Age*, Feb. 1952, p. 12-14, 30.

Production of Al by electrolytic reduction of Al_2O_3 at the above plant. (C23, Al)

39-C. Copper and Copper Alloys. 6. Concerning the Metallurgy of Copper. W. G. R. DeJager. *Metalen*, v. 6, Dec. 15, 1951, p. 452-454.

Processes of copper refining, particularly fire refining and electrolytic refining. Photomicrographs show structure of Cu_2O inclusions in Cu. (C21, C23, Cu)

40-C. Refining Nickel Matte. C. C. Downie. *Mining Journal*, v. 238, Feb. 1, 1952, p. 114-115.

The production and handling of nickel matte in blast furnace and converter in so far as garnierite and nickel silicate ores generally are concerned. (C21, Ni)

41-C. MacArthur-Forrest Cyanide Process. J. S. MacArthur. *South African Mining and Engineering Journal*, v. 62, Jan. 12, 1952, p. 873.

Process used in recovery of gold. (C24, Au)

42-C. Titanium: How It Is Made. *Modern Metals*, v. 8, Feb. 1952, p. 29-31.

The method by which hot TiCl_4 vapor is reduced to metallic Ti by hot, semi-molten Mg. (C26, T5, Ti, Mg)

43-C. Experiences of a Czechoslovakian Engineer in the USSR. (In Czech.) Arnost König. *Hutnické Listy*, v. 6, Nov. 1951, p. 544-546.

Experiences of the author, who made a three-month visit to the USSR, where he studied the production of copper in Soviet metallurgical plants. (C general, Cu)

44-C. Reduction of the Copper Content in Slags From Reverberatory Furnaces. (In Czech.) *Hutnické Listy*, v. 6, Nov. 1951, p. 552-554.

Analyzes the method developed in a certain Czech plant. This method is said to lower significantly the loss of Cu during smelting. (C21, Cu)

45-C. Silicothermic Production of Magnesium. (In French.) W. J. Kroll. *Revue de Métallurgie*, Dec. 1951, p. 929-943; disc., p. 943.

Details of process developed in the U. S., industrial uses, and economic aspects. Tables and diagrams. 78 ref. (C26, Mg)

D FERROUS REDUCTION AND REFINING

91-D. Silica Versus Basic Bricks. T. R. Lynam. *British Steelmaker*, v. 18, Feb. 1952, p. 79, 81.

Relative merits of silica and basic products in the basic openhearth furnace. (D2)

92-D. Low-Carbon Ferro-Chrome-Silicon Cuts Stainless Ingot Costs. N. B. McFarlane. *Iron Age*, v. 169, Feb. 21, 1952, p. 108-110.

The alloy is produced in electric furnaces by carbon reduction from selected ores. The production process. Advantages, particularly lower cost. (D5, SS, Fe-n)

93-D. An Experimental Furnace for the Investigation of Openhearth Furnace Combustion Problems. Part V. Experiments With the Venturi Port and Modifications Thereof. Part VI. Summary of Results and Their Application in Practice. J. F. Allen, J. R. Hall, and A. H. Leckie. *Journal of the Iron and Steel Institute*, v. 170, Jan. 1952, p. 37-48.

The effect on heat transfer of the position of the gas-port nose and the steepness of the ramp roof in ports of the Venturi type. Improved results were obtained by moving the gas port back, and by steepening the roof ramp. Extent to which the experimental results obtained have been applied in practice. Arrangements for future investigations of openhearth furnace combustion problems. (D2, Fe)

94-D. Practical Considerations of Openhearth Bottom Construction. Philip A. Gaebe. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 13-26.

Previously abstracted from *Blast Furnace and Steel Plant*. See item 2-D, 1952. (D2, ST)

95-D. Effects of Low-Manganese Pig Iron on Openhearth Operations. John A. Hornak. *Proceedings, National Open-Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951 p. 27-42.

A statistical analysis. In general, the quality of the final product was not diminished to any appreciable extent by low-Mn pig iron. Data are graphed. (D2, Fe)

96-D. Methods of Increasing Inland Steel's Openhearth Production. George C. Lawton. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 43-50; disc., p. 50-52.

Increasing steel production through the use of existing units. Factors such as quality of scrap, furnace operation, decreasing charging time and various others. (D2, A4, ST)

97-D. Increase in Ingot Production by the Use of Oxygen. E. H. Leathers and C. W. Drabers. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 53-56; disc., p. 56-58.

The amount and quality of raw materials and the necessary auxiliary equipment to properly change increasing tonnage and to handle it after it has been obtained as primary factors in use of O_2 . (D2, ST)

98-D. Increasing Armco Steel Corporation's Openhearth Production. W. W. Bergmann. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 58-59; disc., p. 59-60.

Practices at the No. 1 openhearth shop at the Middleton Division of Armco Steel Corp. (D2, ST)

99-D. Increasing Production at the Kaiser Openhearth Plant. W. F. Bowers. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 61-63; disc., p. 63-64.

Plant practices. (D2, ST)

100-D. Methods of Increasing Openhearth Production. E. J. Dattisman. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 64-65; disc., p. 65-69.

Analyzes some of the fundamentals needed to produce the best tap-to-tap time. (D2, ST)

101-D. Availability of Openhearth Furnaces, Sparrows Point Plant. R. M. Baker. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 70-76; disc., p. 76-77.

Bethlehem Steel Co. plant at Sparrows Point, Md. General repair and maintenance jobs necessary. (D2, ST)

102-D. Furnace Availability at Ford Motor Company. M. J. Smith. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 78-79; disc., p. 79.

Practices of openhearth maintenance and scheduling. (D2, ST)

103-D. Use of Basic Brick to Increase Availability at Weirton Steel Company. S. J. Dougherty. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 80-81; disc., p. 81.

Experiences of above company. (D2, ST)

104-D. Jet Tapper Practice at the Openhearth. H. J. Walker and A. Robert Almeida. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 81-86.

Operating principles and development. Some recent results. (D9, ST)

105-D. Safety Precautions in Jet Tapping. R. H. Ferguson. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 87-91; disc., p. 91-92.

Equipment and procedures for tapping openhearth furnaces. Explosives are used, resulting in substantial advantages in safety. (D9, ST)

106-D. Furnace Design for Increased Production. D. R. Loughrey. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 93-98.

Includes roof construction, front-wall, back-wall, and bottom construction, checkers, flues and stacks, and uptakes. (D2)

107-D. Furnace Design for Increased Production. J. M. Brashear. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 98-101; disc., p. 101.

Design of openhearth furnaces at the Inland Steel plant, East Chicago. (D2, ST)

108-D. Furnace Design and Shop Arrangement for Increased Production. J. L. Hyland. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 102-107.

Practice at the Buffalo plant of Republic Steel Corp. Openhearth furnace diagrams. (D2, ST)

109-D. Some Metallurgical Advantages of the Acid Openhearth Process. H. P. Rassbach. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 109-115; disc., p. 115-119.

Such problems as why large non-metallic inclusions are sometimes found in the interior of large steel sections, the outside of which are flawless, and why a long holding period in a ladle is ineffective in producing clean steel. 10 ref. (D2, ST)

110-D. Combination Basic and Silica Brick in Openhearth Roof Construction. C. G. Poth. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 142-150; disc., p. 150-156.

Results of combinations of alternate courses of silica and basic brick as obtained at the Massillon plant of Republic Steel Corp. (D2)

111-D. Openhearth Bottoms. H. M. Kramer and G. H. Anthony. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 157-161.

An appraisal of magnesite, slag, and Cr-bearing brick. (D2)

112-D. Openhearth Furnace Bottoms, Fairfield Steel Works. C. C. Benton. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 162-165; disc., p. 165-172.

The materials used, scrap contamination and resurfacing of bottoms. (D2, ST)

113-D. Importance of Ladle Lining. C. E. Sumpter. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*,

v. 34, 1951, p. 172-174; disc., p. 174-178. (TSI Am350)

Properties of ladle brick and factors prolonging ladle life. (D9)

114-D. Linings for Hot-Metal Mixers. K. D. Bartels. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 178-183.

Included in the program were blast-furnace brick fired to cone 18, high-fired Missouri superduty fire-clay brick, both dry-pressed and stiff mud, Missouri superduty fireclay brick fired to cone 23, chrome-magnesite brick burned and unburned, sillimanite brick, and 70% alumina brick. (D1, ST)

115-D. Factors Affecting Spread in Manganese Between First and Last Ingots of Rimming-Steel Heats. Michael Tenenbaum and C. C. Brown. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 208-213.

Causes of Mn losses between pouring the first and last ingots. Limited data regarding slag-metal conditions. Data are graphed and tabulated. (D9, ST)

116-D. Factors Affecting Spread in Manganese Between First and Last Ingots. Ralph D. Hindson. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 214-219; disc., p. 219-221.

Investigation showed that losses of Mn were due to type of steel, Mn content, Si content, time in ladle, basicity of furnace slag at tap, and type of ladle lining used. Some methods of decreasing these losses. Data are graphed. (D9, ST)

117-D. Factor Affecting the Surface Quality of Killed Steel Containing 0.15 to 0.20 and 0.40 to 0.55 Per Cent Carbon. L. W. Fleming. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 222-225.

Experience in the manufacture of various grades of steel with special emphasis on furnace working practice and deoxidation, effect of S and Mn on quality of product, pouring practice, including mold conditioning and mold-coating practice, and transit time. Data are tabulated. (D2, D9, ST)

118-D. Factors Affecting Surface Quality of 0.40 to 0.55 Per Cent Carbon Killed Steel. A. E. Reinhard. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 225-226.

Silicon content, sulfur content, and temperature are included in the survey. (D2, ST)

119-D. Factors Affecting Surface Quality of 0.40 to 0.55 Per Cent Carbon Killed Steel. D. J. Taylor. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 227-230.

Includes such factors as pouring practice, mold preparation, control of furnace temperature, and extensive observations of soaking-pit heating practice. (D9, ST)

120-D. Factors Affecting Surface Quality of 0.40 to 0.55 Per Cent Carbon Killed Steel. A. K. Moore. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 230-234.

On the basis of experiences of Steel Co. of Canada, reduction of S, reduction of track time, increasing the rate of pour, and producing better slag-to-metal equilibrium at the block, are recommended for reduc-

tion of rejections in the above range of forging-quality steels. Data are graphed. (D9, ST)

121-D. Production of Mechanically Capped Steel Over 0.15 Per Cent Carbon. E. N. Hibbert. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 234-237.

Major features of the practice in use at Ohio Works of U. S. Steel Co. include: low-melt sulfur in order to obtain low sulfur without "working" sulfur, furnace practice leading to a well-oxidized bath at tap, including tapping at approximately 0.10% C, recarburizing with coal in the ladle, and use of NaF in the molds. (D9, ST)

122-D. Control of Low-Carbon and Killed Steel for Deep Drawing Quality. A. E. Reinhard. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 247-249.

Principal items to guard against in the scrap are alloys and sulfur. (D2, B22, ST)

123-D. Manufacture of Low-Carbon Rimmed and Killed Steels for Deep Drawing. Karl L. Felters. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 250-252.

Methods for deoxidizing the steel. (D2, ST)

124-D. High-Iron Ore Charges for Cold-Metal Heats. H. M. Parker. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 259; disc., p. 259-260.

The practice of charging ore in cold-metal heats to obtain a reasonable melt carbon with above-normal percentages of iron in the charge. (D2, B22, ST)

125-D. Refractories and Their Performance in Cold-Metal Shops. Paul B. Akin. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 261-262; disc., p. 262.

Experiences of the Laclede Steel Co., Alton, Ill. Basic brick was used to increase furnace life as follows: basic-brick end seals on silica furnaces, basic front walls, and all basic ends. (D2)

126-D. Use of Superduty Silica Brick in Openhearth Roofs. C. M. Kay. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 266-267; disc., p. 268.

Advantages found by American Steel and Wire Co., Worcester, Mass. (D2)

127-D. Pit Practice. James L. Jennings and Gordon McMillin. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 269-271; disc., p. 271-272.

Optimum practice for the maintenance and use of runners, ladles, stoppers and nozzles at General Steel Castings Corp., Granite City, Ill. (D9, ST)

128-D. Flow Patterns in Openhearth Furnaces. J. H. Chesters. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 282-306; disc., p. 306-310.

Previously abstracted from *Chemistry & Industry*. See item 225-D, 1951. (D2, ST)

129-D. Use of High-Pressure Gas in the Openhearth. Milton P. Burns. *Proceedings, National Open Hearth Committee, Iron and Steel Division, Amer-*

ican Institute of Mining and Metallurgical Engineers, v. 34, 1951, p. 311-316.

The functions of atomizing fluids. Gases available as atomizing agents. Results of experiments conducted by the Tennessee Coal, Iron and Railroad Co. showed that, with a burner of proper design, natural gas could be substituted for steam as an atomizing agent. (D2)

130-D. Analyses of Waste Gas From Openhearth Furnaces. T. W. Bailey. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 316-318.

When, where, and how samples should be taken. (D2, S11)

131-D. Waste-Gas Analysis. J. M. Brashear. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 318-324.

Some of the results of sampling obtained by Inland Steel Co. Describes certain areas of the furnace where intermittent or continuous sampling of waste gases will prove beneficial to successful operation. Numerous graphs. (D2, S11)

132-D. Use of Treated Water for Cooling Openhearth Equipment. Barney Dagan. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 325-328.

Practices of the Kaiser Steel Corp., Fontana, Calif. (D2)

133-D. Melting With Simple Slags in Acid Electric Furnaces (of Casting Steels). (In Spanish.) Howard Biers. *Instituto del Hierro y del Acero*, v. 3, Oct.-Dec. 1950, p. 288-295; v. 4, Jan.-Mar. 1951, p. 39-51.

Process recommended for melting 4000 and 2500-kg. batches of steel in small electric furnaces with acid linings. Data are tabulated. (D5, ST)

134-D. Present Variables Affecting Openhearth Production in Pacific Coast Cold Metal Shops. George W. Teskey. *Blast Furnace and Steel Plant*, v. 40, Feb. 1952, p. 197-200.

Effect on openhearth production of the current quality and availability of materials used in making up the furnace charge in a basic cold-metal shop. (D2, ST)

135-D. Foundation Develops Process for Producing Articles of Steel. P. E. Cavanagh. *Blast Furnace and Steel Plant*, v. 40, Feb. 1952, p. 220-222.

Previously abstracted from *Iron Age*. See item 72-D and 87-D, 1952. (D8, ST)

136-D. Errors in Blast Furnace Slag Analysis and Their Elimination. E. T. Saxer and E. W. Jones. *Blast Furnace and Steel Plant*, v. 40, Feb. 1952, p. 208-214.

A detailed discussion presenting specific methods for analysis. Includes tabular data. (D1, S11)

137-D. Chemistry in Metal Extraction. F. D. Richardson. *Chemistry & Industry*, Jan. 19, 1952, p. 50-53.

Previously abstracted from *Engineering*. See item 21-D, 1952. (D general, C general, Fe, ST)

138-D. Cupola Hot Metal Increases Steel Production, Cuts Ingot Costs. D. I. Brown. *Iron Age*, v. 169, Feb. 28, 1952, p. 104-107.

Practices of the Central Iron and Steel Div., Barium Corp., Harrisburg, Pa. Openhearth steel production has been increased 25% as a result of hot metal use in what had previously been a cold metal shop. (D2, D7, ST)

139-D. Automatic Control; Installations on British Openhearth Furnaces. J. D. May and W. G. Askew. *Iron & Steel*, v. 25, Feb. 1952, p. 49-52, 59.

Includes general principles of operation, and details of various control schemes. Diagrams. (D2, S18)

140-D. Some Aspects of the Blast-Furnace Situation in the United States. Owen R. Rice. *Journal of the Iron and Steel Institute*, v. 170, Feb. 1952, p. 89-108. (A condensation.)

Operation statistics for more than 100 furnaces in northern and southern states are tabulated, analyzed and compared in the light of a rating formula based on the amount of coke burnt per day per square foot of an annulus 6 ft. inwards from the tuyeres; comparable data for British and other blast furnaces are presented. Ore and coking-coal resources available to the U. S. iron and steel industry; refractory materials, including carbon hearths and linings. High top pressure operation and experiences with oxygen-enriched air, trends in furnace design, construction, equipment, manning, and costs. (D1, A4, Fe)

141-D. Joint Discussion on the Papers—"The Smith Agglomerating Kiln: Plant and Practice at East Moors Works, Cardiff," W. E. Simons; "Sinter Making at Appleby-Frodingham," G. D. Elliot and N. D. Macdonald; "Investigation of the Effects of Controlled Variables on Sinter Quality. Part I. Development of Experimental Sinter Plant and Preliminary Results Using Northants Ore," E. W. Voice, C. Lang, and P. K. Gledhill; and "The Sintering of Northamptonshire Iron Ore," D. W. Gillings, E. W. Voice, C. Lang, and P. K. Gledhill. *Journal of the Iron and Steel Institute*, v. 170, Feb. 1952, p. 123-128.

Covers papers previously published. See items 76-B, 119-B, 146-B, 147-B, 1951. (B16, Fe)

142-D. Discussion on the Paper—"Significance of Equilibrium and Reaction Rate in the Blast-Furnace Process," J. B. Austin. *Journal of the Iron and Steel Institute*, v. 170, Feb. 1952, p. 128-135.

Covers the paper published in April 1951 issue. See item 181-D, 1951. (D1, Fe)

143-D. Discussion on the Paper—"The Present Position of the Converter Process: Economic Comparison With Other Steelmaking Processes," B. Matuschka. *Journal of the Iron and Steel Institute*, v. 170, Feb. 1952, p. 135-139.

Covers paper previously published in May 1951 issue. See item 195-D, 1951. (D3, ST)

144-D. Joint Discussion on the Papers—"Some Aspects of the Blast-Furnace Situation in the United States," Owen R. Rice; "Evolution of the All-Carbon Blast-Furnace," J. H. Chesters, G. D. Elliot, and J. Mackenzie; and "Radio-Active Indicators for Blast-Furnace Refractory Wear," E. W. Voice. *Journal of the Iron and Steel Institute*, v. 170, Feb. 1952, p. 139-146.

Covers papers previously published. See items 228-D, 150-D, 122-D, 1951. (D1, S19, Fe)

145-D. Measurement of Air Infiltration in Openhearth Furnaces. R. Haynes. *Journal of the Iron and Steel Institute*, v. 170, Feb. 1952, p. 149-152.

The direct measurement of air flow, in furnace uptakes and in the culverts below the checkers, using a water-cooled Pitot static tube. Generally, infiltration is found between the culverts and uptakes at low air flows, and air is lost between them when the fan speed is high. (D2)

146-D. Efficient Utilization of Titanium Alloys in Stainless Steel Production. F. St. Vincent and R. W. Rebholz. *Journal of Metals*, v. 4, Mar. 1952, p. 245-246.

Ti alloys used in production of stainless ingots. Melting procedures for reasonable recoveries. Phase diagrams. (D general, M24, Ti, SS)

147-D. Properties of Some Bottom Ramming Materials. M. P. Fedock.

Journal of Metals, v. 4, Mar. 1952, p. 247-249.

Includes test data on six of the more popular ramming materials for electric furnace bottoms, selected to emphasize the wide variation in properties of the different materials. (D5)

148-D. Hydrogen Reduction of Iron Ore. C. A. Scharschu. *Journal of Metals*, v. 4, Mar. 1952, p. 250-251.

Reviews work done on reduction of iron ore with hydrogen to produce a product suitable for electric-furnace melting. (D8, Fe)

149-D. Blowing a Thomas Converter With Oxygen. *Metal Progress*, v. 62, Feb. 1952, p. 108, 110, 112. (Condensed from "Experiments in Blowing a Thomas Converter With Oxygen," G. Husson, *L'Institut de Recherches de la Siderurgie*, ser. A, no. 5, Mar. 1949.) Results of experiments showed that the economics of O₂ enrichment hinges upon the relative costs of O₂ and scrap. (D3, Fe)

150-D. Later Work. *Metal Progress*, v. 62, Feb. 1952, p. 112, 114, 116, 118. (Condensed from "Blowing Tests in a Thomas Converter With Oxygen-Enriched Air," P. Leroy and E. Devernay, *L'Institut de Recherches de la Siderurgie*, ser. A, no. 26, Mar. 1951.) A study on the reduced time of blast with enriched oxygen blast. (D3, Fe)

151-D. Use of O-CO₂ Blast in the Basic Converter. *Metal Progress*, v. 62, Feb. 1952, p. 128, 146. (Condensed from "The Use of Oxygen-Carbon Dioxide Instead of Air in the Final Stage of the Basic Bessemer Process," Bo Kalling, Folke Johansson, and Lennart Lindskog.)

Previously abstracted from *Journal of the Iron and Steel Institute*. See item 285-D, 1951. (D3, Fe)

152-D. High Top Pressures for Smoother Furnace Operation. John R. Barnes. *Steel*, v. 130, Mar. 3, 1952, p. 89-90, 92.

Data covering a 5-year operation of elevated top pressure blast furnaces with 22-ft. diam. hearths. (D1, ST)

153-D. Vitreous Enamelling Cast Iron and Steel. J. W. G. Pedder. *Times Review of Industry*, v. 6, Feb. 1952, p. 22-24.

Data on typical formulas of enameling frits for different processes. (D27, CI, ST)

154-D. Equilibrium Between Blast-Furnace Metal and Slag as Determined by Remelting. E. W. Filer and L. S. Darken. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 253-257.

An investigation to determine how far blast furnace metal and slag depart from equilibrium, particularly with respect to sulfur distribution. Data are graphed and tabulated. (D1, Fe)

155-D. Composition of Blast-Furnace Gas and Efficiency of Blast Furnaces. (In German.) E. Schwarz-Bergkamp. *Berg- und Hüttenmännische Monatshefte der Montanistischen Hochschule in Leoben*, v. 97, Jan. 1952, p. 1-3.

Method of computing optimum charge of blast-furnace coke. Includes graphs. (D1, Fe)

156-D. Bottom Casting of Ingots for the Manufacture of Plates. T. T. Watson. *Industrial Heating*, v. 19, Feb. 1952, p. 265-266, 268, 270, 272, 274, 276, 280.

The general practice of bottom casting as well as metallurgical and pouring practice. The casting of rimmed steel and silicon-killed steel ingots. Tables of data for various ingot sizes show the rate of rise in inches per minute in the mold groups. Plate yield and quality of bottom-cast ingots. (To be continued.) (D9, CI, ST)

157-D. Vacuum Melting; Recent Continental Developments. *Metal Industry*, v. 80, Feb. 22, 1952, p. 145-146. Includes diagrams and illustrations of equipment. (D8, C25)

158-D. The Effect of Stirring on the Rate of Desulfurizing Carbon-Saturated Molten Iron With $\text{CaO-SiO}_2\text{-Al}_2\text{O}_3$ Slags. C. E. A. Shanahan. *Metallurgia*, v. 45, Feb. 1952, p. 59-61. Experimental evidence to show the beneficial effects of this practice. (D general, Fe)

159-D. Blast Furnace Practice. VI (a.), (b.), and (c.), Generation, Recovery and Use of Heat. Charles E. Agnew. *Steel*, v. 130, Feb. 18, 1952, p. 112, 115, 118, 120; Feb. 25, 1951, p. 88, 90, 93; Mar. 10, 1952, p. 118, 120. Theory of M. L. Gruner based on the premise that the theoretical maximum amount of heat is generated from carbon combustion. Analysis shows the theory to be invalid. Comparative data show that the volume of heat required for furnace operation varies between furnaces because of differences in the character of the raw material used. Part VI-b. discusses reasons for and ranges of these variations. In part VI-c. thermal data on a south Chicago stack are investigated. (D1, Fe)

160-D. Contemporary Status of the Theory of Metallurgical Processes in the Production of Steel in the U.S.S.R. (In Czech.) Ivo Petrmán. *Hutnické Listy*, v. 6, Oct. 1951, p. 470-478; Nov. 1951, p. 538-541. Results of theoretical investigations in the field of steel production in the USSR. (D general, ST)

161-D. Phosphorus in Tin Plate in Soviet Practice. (In Czech.) Josef Teindl. *Hutnické Listy*, v. 6, Nov. 1951, p. 546-549. In Soviet practice, it was found that a phosphorus content of 0.08-0.10% is the best for preventing sticking of sheets. It is necessary to melt phosphorus steel in an open-hearth furnace with a basic slag in order to retain the special properties desired. (D2, ST)

162-D. Influence of Gases in Steels. (In French.) A. Kohn. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 821-822, 825-827, 829, 831-833, 835, 837-840. The solubility of gases in liquid and solid steel; influence of the liberation of CO on the solidification of rimmed ingots; flake formation; hydrogen embrittlement; aging of steel; blue brittleness, and bessemer steels of low nitrogen content. Charts, tables, macrographs, and diagrams. 83 ref. (D9, N12, Q23, ST)

163-D. Why Must an Openhearth Furnace be Blown? (In French.) J. E. Lafon. *Métallurgie et la Construction Mécanique*, v. 83, Dec. 1951, p. 965-966, 969; v. 84, Jan. 1952, p. 47-51. A diagrammatic presentation which alone assures effective preheating of the air necessary for good combustion. Part I: General theories and experimental interpretation. Part II: Research on a burner, valves, the blowing process, and future prospects. 13 ref. (D2, ST)

164-D. Present Trends in the Steel Foundry. (In French.) J. P. Quenedy. *Métallurgie et la Construction Mécanique*, v. 83, Dec. 1951, p. 979, 981. The side-blown acid converter, simultaneous use of molded and welded pieces in mechanical construction, and other developments in the French cast steel industry. (D3, E general, CI)

165-D. Harmful Inclusions in Certain Kinds of Special Steels. (In French.) Otto Krifka. *Révue de Métallurgie*, Dec. 1951, p. 895-909; disc., p. 910-911. Macroscopic and microscopic inclusions which arise during the pro-

duction process must be considered as results of the reduction by precipitation. Results of study of such inclusions and of factors which influence their formation are presented for a variety of stainless and alloy steels. 45 photomicrographs. 11 ref. (D general, M27, AY, SS)

166-D. Hydrodynamic Study of Bath Blowing in the Basic Bessemer Converter. (In French.) G. Husson. *Revue Universelle des Mines, de la Métallurgie des Travaux Publics, des Sciences et des Arts Appliqués à l'Industrie*, ser. 9, v. 94, Dec. 1951, p. 436-439. The movement of the molten mass during melting. Hydrodynamic relationships are analyzed. Possible design modifications on the basis of this analysis. (D3, Fe)

167-D. Progress in the Metallurgy of Iron and Steel. (In German.) Rudolf Graef. *Stahl und Eisen*, v. 72, Jan. 3, 1952, p. 1-10. Compares steel-ingot production and output per man in the U. S. and in Western Europe. Characteristic blast-furnace data; improvements in ore preparation; the pressure blast furnace; oxygen enrichment; separate smelting of high and low-grade ores; desulfurization methods; open-hearth plants; fuels; charging methods; repair methods; rolling mills; flame scarfing; reheating furnaces; materials handling, etc. Compares American and European practice. Numerous diagrams, graphs, and illustrations. (D general, B general, F general, ST)

168-D. Experiences With a Box-Type Roof on a 40-Ton Openhearth Furnace. (In German.) Ernst Meier-Cortés. *Stahl und Eisen*, v. 72, Jan. 3, 1952, p. 10-12. New roof design which withstood 774 heats before failure. (D2, ST)

169-D. (Pamphlet) Bibliography on Design, Manufacture, Properties and Use of Ingot Moulds for Steel Ingots. (Covering the Period 1935-1950.) *Iron and Steel Institute*. Bibliographical Series 3A, 1951, 18 pages. (D9, T5, ST)

170-D. (Pamphlet) Bibliography on the Physical Chemistry of the Openhearth Process. (Covering the Period 1940-1949.) *Iron and Steel Institute*. Bibliographical Series 8B, 1950, 30 pages. (D2, ST)

171-D. (Book) The Manufacture of Iron and Steel. Vol. 2. Steel Production. G. Reginald Bashforth. 461 pages. 1951. Chapman & Hall, 37 Essex St., London, W.C.1, England. 46s. Fundamentals of steelmaking; special steels, instrumentation, refectories, and similar related subjects. Diagrams and chapter references. (D general, ST)

(D general, ST)

177-E. Further Mechanical Aids for the Foundry. A. S. Beech. *Institution of Mechanical Engineers, Proceedings*, (Industrial Administration and Engineering Production), v. 165, W.E.P. 63, 1951, p. 27-34; disc. 34-41. New mechanical and semimechanical devices put into practice in the foundry between 1942 and 1949 include the molding machine, brake block production and a modern knock-out station, sand preparation and reconditioning, and a multiple-belt storage hopper. Mechanization in the jobbing foundry. (E general, A5)

178-E. Investment Casting Quality Tied to Gating, Mold Turbulence. Rawson L. Wood and Davidlee Von Ludwig. *Iron Age*, v. 169, Feb. 21, 1952, p. 93-96. Results of a study to determine physical property curves for commonly used ferrous and nonferrous alloys as secured by normal investment foundry processing. Variables investigated are: pouring temperature and its effect on grain size and ductility, investment and flask-temperature effects on grain size and mechanical properties, effect of turbulence as controlled by gating technique, effects of standard heat treatment techniques in developing desired mechanical properties, and effects of environmental variations on final mechanical properties. (E15, Q general, SS, AY)

179-E. Fluidity and Solidification Tests for Molten Steels. W. Ruff. *Journal of the Iron and Steel Institute*, v. 170, Jan. 1952, p. 21-25. A mold with a 400-mm. channel length and a 5-mm. channel diameter is shown to give information on the mechanism of flow, but none of the molds examined is suitable for fluidity estimations. For the control of steelmaking processes, an accurate method for determining the temperature of molten samples when solidification starts is required; a new pot mold, in which the channel is discarded, provides a sensitive sampling method that requires no built-in measuring instrument. (E25, ST)

180-E. 31-Pound Permanent Mold Casting Combines Accuracy and Economy With Exceptional Size. *Precision Metal Molding*, v. 10, Feb. 1952, p. 39, 63-64. The permanent mold casting of an Al oil pan by Continental Motors Corp. (E12, Al)

181-E. To Maintain Alignment Between Interchangeable Magneto Components, American Bosch Uses Die Casting. *Precision Metal Molding*, v. 10, Feb. 1952, p. 40-41. How American Bosch Corp. of Springfield, Mass., die casts Al magneto components. (E13, Al)

182-E. Better Looking Product Plus Greater Density With Investment Casting. Chas. W. Snyder. *Precision Metal Molding*, v. 10, Feb. 1952, p. 81-84. Investment casting of nickel valve bodies, bonnets, and wedges has resulted in improved appearance, reduction in weight of metal in the finished valve, and reduction of machining scrap. Includes micrographs. (E15, Ni)

183-E. Linings for Cupolas in Openhearth Shops. P. R. Sultzbach. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 254-256; disc., p. 256. Experiences of the Stanley Works, Bridgeport, Conn. A bosh-type lining was used and brick consumption for relining was 28.7 lb. per ton of hot metal. (E10, D2, ST)

184-E. A Monolithic Lining for Cupolas. James L. Willis. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 257-258; disc., p. 258. Advantages and disadvantages of using "air-emplacement process." Called the Bondactor, the gun is designed so that compressed air feeds a premixed dry grog of 45% ganister, 30% sand, and 25% fireclay to the gun nozzle, where it is hydrated in an atomized spray of water. (E10)

185-E. How to Lengthen Refractory Life. A. H. Thomson. *Canadian Metals*, v. 15, Feb. 1952, p. 24-25. Refractories for basic electric

- steel furnaces used in the foundry; and how to get best results from present-day materials. Lists 11 variables in furnace operation affecting lining life. (E10)
- 186-E. Bibliography of the Die Casting Process. Part VI.** Harold Bourassa. *Light Metal Age*, Feb. 1952, p. 28, 31. (E13)
- 187-E. In the Foundry. Control of Temperature Gradient During Solidification.** *Light Metals*, v. 15, Feb. 1952, p. 55-57.
Problems encountered in casting Al alloys. (E25, Al)
- 188-E. The Production of Very Small Die Castings.** H. K. Barton. *Machinery* (London), v. 80, Jan. 31, 1952, p. 201-208.
Accuracy of small castings as related to die size. Various features related to center-gated dies. Methods employed for threaded components. Diagrams. (E13)
- 189-E. Low-Pressure Die Casting; Current Practice With Aluminium Alloys.** H. K. Barton. *Metal Industry*, v. 80, Feb. 1, 1952, p. 87-88.
The cold-chamber process, using pressures of 100 atm. or higher. Mechanical properties resulting from the technique are tabulated. (E13, Al)
- 190-E. Sinter Layer Formation on Cast Metals.** *Metal Progress*, v. 62, Feb. 1952, p. 122, 124. (Translated and condensed from "Colloidal Phenomena in Metals. XII. Explanation of the Phenomena of Crust Formation During Casting of Metals on the Basis of the Electrochemical Theory of Slags". Yu. A. Klyachko and L. L. Kunin.)
Previously abstracted from *Zhurnal Prikladnoi Khimii*. See item 14B-139, 1949. (E11)
- 191-E. Grain Refinement of Aluminium Alloys.** *Metal Progress*, v. 62, Feb. 1952, p. 152, 154, 158. (Condensed from "The Grain Refinement of Aluminium Alloy Castings by Additions of Titanium and Boron". A. Cibula.)
Previously abstracted from *Journal of the Institute of Metals*. See item 526-E, 1951. (E25, Al)
- 192-E. Rare Metals Require Precision Furnacing.** Frank Gbadlo. *Steel*, v. 130, Mar. 3, 1952, p. 76-78.
New concepts and techniques in the furnacing and casting of the less common metals. Use of high-vacuum techniques and inert-gas atmospheres is said to be mandatory for Ti, Zr, Ta, Ch, U, Th, Ca, and Mg. (E general, EG-b)
- 193-E. Simplification in the Production of Medium Sized Cast Pieces.** (In Dutch.) A. Cappon. *Metalen*, v. 6, Dec. 15, 1951, p. 441-447.
Improved system for sand casting fairly large iron structures. The method is called "molding with the joint facing upwards". Important savings in sand, handling, and time are claimed. Cement sand can replace loam in the semipermanent mold system described. For certain castings, the mold may be fully permanent. (E11, E12, CI)
- 194-E. Sand Treatment. Part 1.** A. S. Beech. *Canadian Metals*, v. 15, Feb. 1952, p. 23, 30-31.
The characteristics of an efficient sand mill, contrasting batch with continuously operating mills. Stresses the importance of control of grain size, moisture content, and reconditioning sand. (To be continued.) (E18)
- 195-E. Steel Founders' Society Marks Fiftieth Anniversary.** *Foundry*, v. 80, Mar. 1952, p. 86-91, 249.
New developments in foundry practice; research promoted by the society. (E general, A9, CI)
- 196-E. Limited Mechanization in the Jobbing Foundry.** Edwin A. Swenson. *Foundry*, v. 80, Mar. 1952, p. 92-95, 247-249.
Department-by-department mechanization carried out by General Foundry & Mfg. Co., Flint, Mich., a gray-iron foundry of diversified production. (E11, A5, CI)
- 197-E. Hardware Castings Produced in Modern Nonferrous Foundry.** Edwin Bremer. *Foundry*, v. 80, Mar. 1952, p. 98-101, 172.
Production at Attwood Brass Works, Grand Rapids, Mich. Materials include Al, Mn bronze, Sn bronze, brass, bearing bronze, etc. (E11, Al, Cu)
- 198-E. Modern Trends in Molding Machines and Core Blowers.** George E. Miller. *Foundry*, v. 80, Mar. 1952, p. 102-105, 215-216.
(E19, E21)
- 199-E. Experimental Production of Nodular Graphite in Cast Iron.** Alexander I. Krynitsky and Harry Stern. *Foundry*, v. 80, Mar. 1952, p. 106-111, 243-246.
An investigation conducted to study the effect of composition, melting and pouring temperatures, nucleation technique, and cooling rate, and of such addition agents as Mg, MgO, magnesite, FeS, Ca, Ni, Cr, Mo, and B on the formation of nodular graphite in cast iron. This study supports the belief that nodular graphite is formed in the melt during solidification, and graphite patches are produced after solidification by decomposition of carbides. (To be continued.) (E25, CI)
- 200-E. Effect of Raw Materials on Cupola Operation.** Bernard P. Mulcany. *Foundry*, v. 80, Mar. 1952, p. 144, 148, 153.
Effect on quantity and quality of pig iron. (To be continued.) (E10, B22, Fe)
- 201-E. One Way to Repair a Damaged Casting.** Pat Dwyer. *Foundry*, v. 80, Mar. 1952, p. 259-261.
Method of patching a gray iron casting by pouring molten metal into the cavity and at the same time fuzing the surface so the patch becomes a part of the casting. (E general, CI)
- 202-E. Further Discussion of Resin in Foundry Practices.** *Foundry Trade Journal*, v. 92, Feb. 14, 1952, p. 175-177.
Discussion on a paper "Synthetic Resins in the Foundry", G. L. Harbach and P. G. Pentz, published in July 5, 1951 issue. See item 401-E, 1951. (E18)
- 203-E. Investment Casting.** *Machinery* (London), v. 80, Feb. 21, 1952, p. 311-319.
Review of equipment, methods and techniques employed by Birmingham Small Arms Co., Ltd., Sparkbrook, Birmingham, England. Application is to low-alloy steels. (E15, AY)
- 204-E. Precision Casting.** M. Pomey. *Microtechnic* (English Ed.), v. 5, Nov.-Dec. 1951, p. 325-342; disc. p. 343-344. (Translated from the French.)
The wax pattern and plaster-mold method (E15, E16)
- 205-E. Pressure Casting.** M. Grunberg. *Microtechnic* (English Ed.), v. 5, Nov.-Dec. 1951, p. 353-364; disc. p. 365. (Translated from the French.)
The method, hot and cold chamber machines, alloys used, and possibilities and future of die casting. Diagrams and tabular data. (E13)
- 206-E. Sealing Metal With Metal; Tinchner Impregnation Process for Salvaging Porous Castings.** D. W. Holmes. *Modern Metals*, v. 8, Feb. 1952, p. 53-54.
Process used by Tinchner Products Co., Sycamore, Ill. which employs metallic oxides as sealants for castings. Process can be used for the impregnation of Al, Mg, and Zn die castings as well as for sand cast iron, steel, stainless, bronze, brass, Al and Mg. (E25)
- 207-E. Unusual Techniques Developed for Precision Castings at AlRe-**
- search. Western Metals**, v. 10, Feb. 1952, p. 40.
Two basic techniques are utilized in the company's casting operations—centrifugal for the production of high-speed wheels, and static sand casting for cast iron parts which fall generally into the classification of nonmoving. In its static sand castings of the pressure type, AlRe-search utilizes virgin ingot with Mg added to bring the casting metal up to desired standards. (E14, E11, CI, Mg)
- 208-E. Die-Casting Machines.** (In French.) R. Grunberg. *Métallurgie et la Construction Mécanique*, v. 83, Dec. 1951, p. 983-984, 987, 989.
Cold-chamber, hot-chamber, and vertical cold-pressure chamber machines. Advantages and disadvantages of cold-chamber machines. Diagrams and photographs. (E13)
- 209-E. Use of Heat-Radiating Liners for Risers in Steel Castings.** (In German.) E. Lanzendörfer. *Giesserei*, v. 38, Dec. 27, 1951, p. 661-664.
A new British process for heating the sides of liners and in this way keeping the melt warm much longer than usual. Method of operation advantages. (E22, CI)
- 210-E. Innovations and Possibilities for Development in Foundry Mechanization.** (In German.) E. Knipp. *Giesserei*, v. 29, Jan. 10, 1952, p. 2-6.
Diagrams and illustrations show possibilities. Methods for mechanizing the foundry process by shortening the transportation within the plant and decreasing the amount of material involved in casting. Utilization of waste sand and various types of new machinery for continuous casting. (E general, A5)
- 211-E. Lost Wax Casting Process in Foundry Practice.** (In German.) W. Heilmann. *Giesserei*, v. 29, Jan. 10, 1952, p. 6-9.
Advantages in savings of material and casting of material of poor machinability; future possibilities. (E15)
- 212-E. Coke Charge and Coke Quality for Cupola Melting.** (In Swedish.) W. von Preen. *Gjuteriet*, v. 41, Dec. 1951, p. 183-185.
Problems involved in use of poor-quality coke and methods for minimizing the difficulties encountered. (E10, CI)
- 213-E. (Book) Casting Alcoa Alloys.** 135 pages. 1951. Aluminum Co. of America, Gulf Building, Pittsburgh 19, Pa.
General characteristics, foundry considerations and principles, heat treatment, mechanical and physical properties, and numerous applications. (E general, Al)
- 214-E. (Book) Foundry Work.** Edwin W. Doe. 109 pages. 1951. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. \$1.76.
Presents the simple principles of foundry practice, first by referring to the several phases of the industry in a general way, and secondly by arranging a series of molding problems that will exemplify the application of this knowledge in a practical manner. (E general)

F

PRIMARY MECHANICAL WORKING

- 72-F. New Forging Technique Utilizes Instrument Controlled Radiant Gas Heating Equipment.** C. C. Roberts. *American Gas Journal*, v. 176, Feb. 1952, p. 16-17.
Equipment for heating steel rods to the correct temperature for forg-

ing. Advantageous forging qualities attained. An illustration of SAE 52100 steel shows the difference in grain structure produced by high-speed radiant gas heating and by conventional slower methods. (F22, ST)

73-F. Open Die Forges Titanium Cones. Harold Bernstein and Ernest T. Nicotera. *American Machinist*, v. 96, Feb. 1952, p. 136-137.

Results of tests which prove that carbon-bearing Ti can be worked, under proper conditions, into a hollow forging. (F22, Ti)

74-F. Die Forging of Steel. J. D. Latta. *British Steelmaker*, v. 18, Feb. 1952, p. 82-88.

The principles of die design and the manufacture of dies. Possibilities of this forging process both from the production and the cost point of view. The forging process and the plant used. (F22, ST)

75-F. A Way to Squeeze the Most Out of Strategic Materials. *Inco Magazine*, v. 25, Winter 1951-52, p. 22-23.

Saving of metal and machining costs through use of upset forgings. (F22)

76-F. A Theory of Tube Sinking. S. Y. Chung, and H. W. Swift. *Journal of the Iron and Steel Institute*, v. 170, Jan. 1952, p. 29-36.

Stresses and strains during tensile sinking of tubes. A theory is developed to calculate the sinking load, and to predict thickness and elongation strains that occur during tube sinking in dies of industrial profile. Friction, bending, thickness variation, and strain-hardening are considered. Effects of "thickness" stress distribution on strain development were investigated for steel, brass, and Cu. (F26, ST, Cu)

77-F. Abbey Works: A Description of the Rolling Mills and Accessory Plant. H. H. Ascough. *Sheet Metal Industries*, v. 29, Feb. 1952, p. 101-114.

Details of the 45-in. slabbing mill, slab shears, slab heating, 90-in. continuous mill, hot strip mill descaling, plate and sheet finishing, cut-up line, annealing, etc. (F23, ST)

78-F. The Working of Metals. W. C. F. Hesseberg. *Sheet Metal Industries*, v. 29, Feb. 1952, p. 144-146. (A condensation.)

Influence of internal and external strains on the properties of metals and alloys, with special reference to wiredrawing and rolling mill operations. (F23, F28, Q general)

79-F. Hadfield's New Heavy Forge Machinery (London), v. 80, Jan. 31, 1952, p. 195-200.

Two air-hydraulic forging presses of 2700- and 1500-ton capacity, together with the necessary reheating and heat treatment furnaces. (F22, J general)

80-F. Roll Size Effects in Rolling of Strip. N. H. Polakowski. *Metal Progress*, v. 62, Feb. 1952, p. 67-71.

Shows why roll diameter limits maximum draft and minimum thickness, but has no important effect on power required per ton of thin strip rolled. (F23)

81-F. Metallurgy of Drop Forging. E. Gregory. *Metal Treatment and Drop Forging*, Feb. 1952, p. 67-72; disc. 72-74.

Metallurgical aspects, including overheating and burning. (F22)

82-F. Tool and Die Materials for the Extrusion of Nonferrous Metals. *Metal Treatment and Drop Forging*, Feb. 1952, p. 86-88.

A discussion sponsored by the Institute of Metals at the University of Birmingham. (F24, G5, T5, TS, EG-a)

83-F. The Wire Capacitor and Other Composite Drawn Products. J. L. H. Jonker and P. W. Haaijman. *Philips*

Technical Review, v. 13, Dec. 1951, p. 145-151.

By means of a special drawing process—the drawing of a tube containing a wire core, with the space in between filled with an insulating material—it was found possible to manufacture capacitors possessing very good properties. Details of manufacture utilizing Cu and Ni, and some applications. (F28, Ti, Cu, Ni)

84-F. Correct Cutting Practices for Stainless Steel Sheets. E. M. Rains. *Sheet Metal Worker*, v. 43, Feb. 1952, p. 42-43.

(F29, SS)

85-F. Manufacture of Large-Diameter Pipe. *Welding and Metal Fabrication*, v. 20, Feb. 1952, p. 49-53.

Forming, welding, and testing the transcontinental gas pipe line of special Mn steel. (F26, AY)

86-F. Control of Die Profiles by Measurement of Die Load and of Partly Drawn Wire. J. G. Wistreich. *Wire Industry*, v. 19, Feb. 1952, p. 131.

Includes tabular data comparing methods of measuring profiles and sizes of wire-drawing dies (F28)

87-F. Electrical Equipment in Steel Mills. W. B. Ferguson. *Midwest Engineer*, v. 4, pt. 1, Jan. 1952, p. 3-4, 20-23, 25.

Bessemer requirements, rolling mills, cold strip mills and motor problems. (F23, D3, ST)

88-F. Increasing Drop Forging Die Life. Part IX. Die Lubrication. John Mueller. *Steel Processing*, v. 38, Feb. 1952, p. 68-70, 101.

Graphitic materials as suitable lubricants. Other factors such as proper forging and finishing temperature. (F1, F22)

89-F. Greater Flexibility in Aluminum Extrusion Cuts Cost of Short Runs. Herbert Friedman. *Western Metals*, v. 10, Feb. 1952, p. 47-48.

Techniques of billet heating and extrusion which permit greater flexibility and consequently lower cost per unit for short production runs. (F24, Al)

90-F. Magamp Regulation of a Tandem Cold-Reduction Mill. W. R. Aul. *Westinghouse Engineer*, v. 12, Mar. 1952, p. 64-66.

Application of magnetic amplifiers in the control of drive equipment on tandem cold reduction steel mills. (F23, S18, ST)

91-F. Beryllium Copper Wire: Its Processing and Uses. John T. Richards. *Wire and Wire Products*, v. 27, Feb. 1952, p. 149-154, 192-193, 195.

Drawing, heat treating, plating, joining, and applications. Table, graphs, and illustrations. (To be continued.) (F28, Cu)

92-F. Influence of the Distribution of C, P, and S on the Use of Ingots of Rimmed Openhearth Steel for the Production of Tubes. (In Czech.) Vaclav Rauner. *Hutnické Listy*, v. 6, Dec. 1951, p. 582-586.

A study was made of the effect of segregation on the use of rimmed openhearth ingots for the production of seamless tubing. The steels used contained up to 0.15% C. 117 macrographs of ingot structures. (F26, N12, M28, CN)

93-F. Commission of Engineers of Large and Small Rolling Mills. (In French.) *Circulaire d'Informations Techniques*, v. 9, Jan. 1952, p. 91-112.

Summaries of a series of reports by various authors on rolling mills with respect to means of protecting steel, rolling of incompletely solidified rail ingots, deformation of the segregated zone of rimmed soft steel during rolling, etc. Tables, diagrams, and photographs. (F23, ST)

94-F. Extrusion of Steel. (In French.) J. Sejournet. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 889-891.

The working of nonferrous metals, economic aspects, and future possibilities. Drawing and photographs. (F24, ST)

95-F. Modern Controls and Drives for Rolling Mills. (In German.) Conrad von Kissing. *Stahl und Eisen*, v. 72, Feb. 14, 1952, p. 165-173; disc., p. 173-174.

Includes limitations of each type. (F23)

96-F. Heavy Crankshafts. Production of Integral Fibrous Structure. (In French.) J. M. Vialle and J. Lafont. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 929-931, 933.

The structure of a steel ingot, and changes which it undergoes upon hot transverse deformation. How hot forging can be used to produce crankshafts having desired structure. Advantages over former methods. Micrographs, sketches, photographs, and tables. (F22, CN)

97-F. Equipment for Hot Rolling of Sharp-Angled Steel T-Bars. (In French.) Louis Gascuel. *Métallurgie et la Construction Mécanique*, v. 83, Dec. 1951, p. 991, 993, 995.

Includes diagrams. (F23, ST)

98-F. Heat Transfer and Furnace Efficiency in the Rapid Heating of Steel. (In German.) C. A. Landermann. *Bau und Betrieb*, v. 4, Jan. 1952, supplement to *Gas- und Wasserfach*, v. 93, Jan. 1, 1952, p. 1-3.

Includes tabulated and graphed data, showing a linear relationship between rate of charge per unit hearth area and attainable thermal efficiency. Applicable both to heat treating and hot working operations. (F1, J general, ST)

99-F. Gaging and Preparation Process for Drawing-Die Holes With Predetermined Rounding-Off Radii and Bearing Lengths. (In German.) Siegfried Werth. *Stahl und Eisen*, v. 72, Jan. 17, 1952, p. 66-69.

Accuracy of measuring the bearing length of finished drawing dies by the two-needle method; calculation of the initial bearing length of a sharp-edged die contour; and determination of the rounding-off radius by intermediate measurements during manufacture. Schematic diagrams and tables. (F28, T5)

100-F. Effect of Coil Weight and Rolling Speed on the Hourly Output of Cold Rolling Mills. (In German.) Hans Pannek. *Stahl und Eisen*, v. 72, Jan. 17, 1952, p. 70-75.

Development of output diagrams for rolling heavy sections, for rolling thin sections, for reversing mills, for a tandem mill. Graphs. (F23, ST)

101-F. Output and Efficiency of Cold Rolling Mills Shown by a Graphical Method of Universal Validity. (In German.) Werner Lueg. *Stahl und Eisen*, v. 72, Jan. 17, 1952, p. 75-79.

Derivation of the efficiency of cold rolling mills and of their output from the rolling-time formula of A. Pomp. Two nomographs for application. (F23)

124-G. Europe Studies Carbide Cutting. E. J. Tangerman. *American Machinist*, v. 96, Feb. 1952, p. 134-135.

Some of the latest answers on carbide cutting, in pictures, from the research of J. A. Pekelharing, head of research for N. V. Philips Gloeilampenfabriken, Eindhoven, Holland; and E. M. Trent of Hard Metal Tools, Ltd., Coventry, England. (G17, C-n)

G SECONDARY MECHANICAL WORKING

125-G. How to Run a Drillpress. H. E. Linsley. *American Machinist*, v. 96, Feb. 1952, p. 147-162.

The principles of drilling; the various types of drill presses and how to care for them; the proper feeds and speeds for different classes of material; what coolants to use, and when; how to grind drills; how to hold the work; and how to perform operations other than straight drilling. Graphs, and tabulated data. (G17, ST, SS, CN)

126-G. How To Get the Most Out of Bandsaw Blades. H. J. Chamberland. *American Machinist*, v. 96, Feb. 1952, p. 164-165.

Results of tests using SAE 1020 steel. Cutting rate and time, volume of metal removed, and saw width, set, and gage before and after test. Mechanical properties, transformations, and microstructure of the steel. (G17, CN)

127-G. Tests of a New Technique for Metal-Cutting Lubrication Show You Can Get 3 to 12 Times as Much Life From Cutting Tools. *Factory Management and Maintenance*, v. 110, Feb. 1952, p. 120-123.

See abstract of "Jet Stream Lowers Cutting Tool Temperatures", *Steel*; item 72-G, 1952. (G21)

128-G. The Effect of Speed and Feed on the Mechanics of Metal Cutting. B. T. Chao and G. H. Bisacre. *Institution of Mechanical Engineers, Proceedings*, (Industrial Administration and Engineering Production), v. 165, W.E.P. 63, 1951, p. 1-9; disc. 10-13.

With respect to cutting speed or feed of a metalcutting tool, changes in the geometry of the chip, tool forces, tool build-up, and surface finish occur. A logical theory to explain these variations in the mechanics of the process is attempted. The problem of tool wear is not included. A series of tests was conducted on mild steel and Cu, over a wide range of speed, feed, and tool angle. (G17, CN, Cu, TS)

129-G. The Fundamental Geometry of Cutting Tools. G. V. Stabler. *Institution of Mechanical Engineers, Proceedings*, (Industrial Administration and Engineering Production), v. 165, W.E.P. 63, 1951, p. 14-21; disc. 21-26.

A full geometrical analysis of a cutting-tool edge is made. The fundamental angles are related to traditional workshop terms, and may readily be applied to any cutting tool. A law of chip flow is given and its effects on the resulting chip shape are analyzed. The effect of unit cube passing through the shear plane is also analyzed and a method is given for finding the direction cosines of the axes of the ellipsoid of stress. The flow law is used to find the directions of the cutting force between chip and tool and its various components. Although predominantly theoretical, the paper has a practical background. (G17)

130-G. Design and Application of Tungsten Carbide to Blanking and Piercing Press Tools. K. L. Pickett. *Sheet Metal Industries*, v. 29, Feb. 1952, p. 129-143.

See abstract from *Machinery* (London), item 119-G, 1952. (G17, C-n)

131-G. Heavy Scrap Cutting in the Steel Mill. L. P. Elly. *Welding Journal*, v. 31, Feb. 1952, p. 97-101.

How application of oxy-fuel gas cutting increases the volume of heavy melting scrap delivered to the openhearth and lowers the cost of scrap preparation. (G22, ST)

132-G. Cutting and Flame Processing. R. S. Babcock. *Blast Furnace and Steel Plant*, v. 40, Feb. 1952, p. 215-219.

Various flame-cutting applications to heavy equipment, scrap, slabs, ingots, etc. (G22, Fe, ST)

133-G. Revolutionary Metal Cutting Development Announced. *Blast Furnace and Steel Plant*, v. 40, Feb. 1952, p. 228.

See abstract of "Jet Stream Lowers Cutting Tool Temperatures", *Steel*; item 72-G, 1952. (G21)

134-G. Fabricated Culvert Pipe for Labrador. *Canadian Metals*, v. 15, Feb. 1952, p. 44-45.

Application of corrugated metal plate for drainage culverts. Traveling shop incorporating punch-riveter and forming roll makes the pipe from sheet steel near the point of use. (G11, K13, T4, CN)

135-G. Fabricating Aluminum Washing Machine Tubs. *Canadian Metals*, v. 15, Feb. 1952, p. 46.

Press operations in drawing the tubs. (G4, AI)

136-G. Machinability of Metals. Francis W. Boulger. *Canadian Metals*, v. 15, Feb. 1952, p. 52.

Various theories resulting from scientific research on properties important in machining. (G17)

137-G. Titanium Fabrication Progress. James Joseph. *Light Metal Age*, Feb. 1952, p. 10-11, 30.

Production machining, hot forming, work hardening, and tapping difficulties. (G17, G general, Ti)

138-G. New Basic Concept of Metal Removal Increases Tool Life Several Hundred Per Cent. *Machine and Tool Blue Book*, v. 48, March 1952, p. 225-226, 228-229.

See abstract of "New Metal Cutting Concept Lengthens Tool Life", *Steel*, item 87-G, 1952. (G17)

139-G. New Cutting Fluid Eliminates Rust, Gum, Stink. William F. Schleicher. *Machine and Tool Blue Book*, v. 48, March 1952, p. 251-254, 256.

Product referred to as "Trim" is the result of several years' intensive research which delved deeply into the causes of gumming and other objectionable features of cutting fluids. With this coolant, it is said to be necessary to change tools only once in every four to six weeks. (G21)

140-G. Design and Application of Tungsten Carbide Blanking and Piercing Tools. K. L. Pickett. *Machinery* (London), v. 80, Jan. 31, 1952, p. 209-213. (A condensation.)

Continues a discussion on various points to be observed in designing cemented carbide press tools. (G2, T6, C-n)

141-G. Forming Titanium Parts for Aircraft. O. A. Wheelon. *Machinery* (London), v. 80, Feb. 7, 1952, p. 223-228.

Tests made to determine fabrication characteristics for design and manufacturing guidance. Production operations. (G general, T24, Ti)

142-G. Improvements in Quality of Deep Drawing Sheet Steel. T. F. Olt and R. S. Burns. *Metal Progress*, v. 62, Feb. 1952, p. 51-56.

Changes in manufacturing methods. Variation in properties in drawn steel and its causes. Other means of securing a greater degree of uniformity in mechanical properties and drawing behavior. Future trends. (G4, Q general, CN)

143-G. Titanium; Cutting Its Alloys With Band Tools. H. J. Chamberland. *Western Machinery and Steel World*, v. 43, Feb. 1952, p. 80-81.

Some of the factors to be considered. (G17, Ti)

144-G. Forming Titanium. *Aircraft Production*, v. 14, Mar. 1952, p. 74-75.

Results of experiments by Ryan Aeronautical Co., San Diego, Calif. to determine the behavior of Ti when welded, formed, and heat treated. Most stainless steel forming techniques can be adapted to the fabrication of Ti parts. Data are tabulated. (G general, K general, J general, Ti)

145-G. Stretch-Forming. Part 1. Construction and Operation of the Sheridan Longitudinal Machine; Forming Technique. Richard Wood. *Aircraft Production*, v. 14, Mar. 1952, p. 77-84.

An extensive description. (G9)

146-G. CO₂ Cools Tools. Paul E. Brunberg. *American Machinist*, v. 96, Mar. 3, 1952, p. 129-132.

Introduction, discussing advantages and disadvantages of CO₂ as coolant, is given by E. J. Tangerman. Use of solid or liquid CO₂ on hardened toolsteel, Ti alloys, Hastelloy, Inconel, and high-Ni and Cr-Co compositions. (G21, TS, Ti, Ni, Cr, Co)

147-G. Arc Machining Makes Hard-to-Cut Jobs Easy. H. V. Harding, V. E. Matulaitis. *American Machinist*, v. 96, Mar. 3, 1952, p. 136-141.

Basically, the process consists of the development of a series of electrical discharges, called intermittent arcs, between an electrode and the surface of a metal workpiece in the presence of a fluid. Factors to be considered and applications. (G17)

148-G. How to Drill Titanium Alloys. *American Machinist*, v. 96, Mar. 3, 1952, p. 141.

Data on drilling, reaming and tapping the material, based on recent tests. (G17, Ti)

149-G. Titanium Ground by Lockheed. *American Machinist*, v. 96, Mar. 3, 1952, p. 175.

Some recent research on grinding Ti by Lockheed Aircraft Corp. (G18, Ti)

150-G. New Cutting Methods Cope With Ever-Harder Alloys. *Business Week*, Mar. 15, 1952, p. 144-146, 148.

Use of dry ice to cool the workpiece and cutting tool in machining "unmachinable" alloys; i.e., high Cr, W, or Co, and Ti. The electric-arc machining method. (G17, Ti, Cr, Co, W, SG-j)

151-G. Oil Speeds Metal Cutting. *Chemistry*, v. 25, Feb. 1952, p. 7-8.

See abstract of "Jet Stream Lowers Cutting Tool Temperatures", *Steel*; see item 72-G, 1952. (G21)

152-G. Theory of Electric Spark Machining. E. M. Williams. *Electrical Engineering*, v. 71, Mar. 1952, p. 257-260. (To be published in *AIEE Transactions*, v. 71, 1952.)

The electric spark machining process is assuming industrial importance in the tool and die industry. A typical electric system for this process, and a theory for the mechanism of its operation together with results of experimental tests. 13 ref. (G17)

153-G. New Methods for Testing Machinability of Gray Iron. Edward A. Loria. *Foundry*, v. 80, Mar. 1952, p. 174-175, 178, 180, 182.

Experimental data on various types are tabulated and charted. (G17, CI)

154-G. Manufacture and Use of Graphitic Tool Steels Show Vast Progress. Parts I and II. A. F. Sprankle. *Iron Age*, v. 169, Feb. 28, 1952, p. 100-103; Mar. 13, 1952, p. 106-110.

The effect of graphite content on machinability of toolsteels was studied. Milling energy vs. graphitic carbon content, and effect of graphitization on drilling torque and thrust. Data are graphed. Extensive tabular data on graphitic toolsteel applications. (G17, T6, TS)

155-G. What You Can Do About the Diamond Wheel Shortage. L. R. Metzger. *Iron Age*, v. 169, Mar. 6, 1952, p. 203-207.

The diamond wheel shortage and our dependence on the use of diamonds for true grinding wheels used in precision, close-tolerance grinding of engine and machine parts and cemented carbide tools. (G18, C-n)

154-G. **High Speed Machining—A Primer.** George Elwers. *Iron Age*, v. 169, Mar. 6, 1952, p. 224-226.

Shows how high-speed machining reduces distortion of metal. Includes tabular data and photomicrographs. (G17)

157-G. **Rolled Sections Replace Forged Jet Blades.** *Iron Age*, v. 169, Mar. 6, 1952, p. 227.

Fabricating method which will replace forged blades in the compressor stator of the J-47 turbojet engine. Airfoil section of the blades is cut from stainless strip rolled to contour, attached to separately-formed bases by welding. Material savings: 39%. Cost savings: 55%. (G11, SS)

158-G. **Russians Machine Bearing Balls Electro-Mechanically.** Henry Brutchter, translator. *Iron Age*, v. 169, Mar. 13, 1952, p. 98-99. (From paper by N. A. Fankratov, P. B. Gofman, and M. M. Feldman. *Promyshlennaya Energetika*, Oct. 1950, p. 10-11.)

How low-alloy bearing balls are machined electromechanically at Russia's State Bearing Works. Balls roll between charged upper and lower disks. Lower disk rotates at 500 to 600 rpm. Micro-arcs soften ball surface and rotating disk throws off softened metal particles. Metal removal varies directly with voltage. Slightly pitted and decarburized surface of ball is removed by hard lapping. Balls can be fed into machine and removed automatically, giving high production rates. (G17, AZ)

159-G. **Shotpeening as a Factor in the Design of Gears.** *Journal of American Society of Naval Engineers*, v. 64, Feb. 1952, p. 181-190.

Previously abstracted from *Machine and Tool Blue Book*. See item 9-G, 1952. (G23, Q23, Q9, ST)

160-G. **Deep Drawing: Development of Aluminum Bronze Alloys for Dies.** S. C. Jones. *Metal Industry*, v. 80, Feb. 22, 1952, p. 152-153.

Requirements of a successful die material and work undertaken by Rolls-Royce, in collaboration with N. C. Ashton, on the development of an Al bronze composition with a high Brinell hardness. Fabrication of the dies, including centrifugal sand casting, machining, and finishing. (G4, T5, Cu)

161-G. **2nd Biennial Meeting Concerning High Precision Mechanics.** *Microtechnic* (English Ed.), v. 5, Nov.-Dec. 1951, p. 259-425.

A series of papers on various aspects of high-precision production and inspection, presented at Paris, Sept 5-10, 1951. Selected papers are separately abstracted. (G general, S general)

162-G. **Superfinish in the Service of Precision.** A. Meynier. *Microtechnic* (English Ed.), v. 5, Nov.-Dec. 1951, p. 309-314; disc., 315-316. (Translated from the French.)

Precision finishing, lapping, honing, new processes, and examples of mechanical super and micro-finishing. (G19)

163-G. **Drawing Compounds From the Standpoint of Stampers.** *Modern Industrial Press*, v. 14, Feb. 1952, p. 6, 8.

An analysis of the replies received to these questions: "Do you use different types of drawing compounds or lubricants for different metals?" and "If so, what are the different requirements for different metals?" (G21)

164-G. **Plastic Tooling for Aircraft Production: New Phenolic Material Provides Means for Quick, Easy Casting of Wide Variety of Forming Tools.** Frank Chariv. *Modern Machine Shop*, v. 24, Mar. 1952, p. 144-148, 150.

Process by which low-viscosity phenolic casting resin is currently being used by western aircraft man-

ufacturers as a means of lowering the cost, without minimizing the quality, of Hydropress form blocks, stretch press dies, drill jigs, check fixtures, assembly jibs, etc. (G general)

165-G. **Stretch-Forming Magnesium.** Robert B. Stanton. *Modern Machine Shop*, v. 24, Mar. 1952, p. 223, 230.

Internally heated stretch dies developed by North American Aviation and Consolidated Vultee Aircraft. (G9, Mg)

166-G. **Forming Dies Made of Densified Wood.** *Modern Metals*, v. 8, Feb. 1952, p. 34.

Forming dies made of wood impregnated with Bakelite phenolic resins are being used in the deep and shallow drawing of Al parts. The new material is called "Hi-Den"; applications in production of military and civilian parts. (G4, Al)

167-G. **Press Load Calculations: Electronics Replaces Theory.** *Steel*, v. 130, Mar. 10, 1952, p. 112-113.

How the complicated problem of determining accurately and instantly the actual loads developed in a press under production conditions is solved electronically by use of a new instrument. (G1)

168-G. **Hot Forming Practice At Northrop Aircraft.** Part II. Gilbert C. Close. *Steel Processing*, v. 38, Feb. 1952, p. 76-79.

Results of tests to determine the effects of various hot forming methods on mechanical properties of some Al alloys. (G general, Q general, Al)

169-G. **Manufacture of Extruded Aluminum Cylindrical Containers With Clamped Tops.** (In Italian.) P. Balduzzi. *Alluminio*, v. 20, Dec. 1951, p. 553-557.

Equipment and procedures of Italian plant for impact extrusion of cans. (G5, Al)

170-G. **Oxygen Cutting of Steel by a Two-Flame Kerosene Torch.** (In Russian.) S. V. Begun. *Avtogetnoe Delo*, v. 22, May 1951, p. 24.

The apparatus. (G22, ST)

171-G. **Reduction of the Zone of Plastic Deformation Taking Place During Machining of Metals Under the Action of Surface-Active Liquids.** (In Russian.) G. I. Epifanov and L. A. Shreiner. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 11, 1951, p. 781-782.

Depths of the zone of plastic deformation of aluminum under various conditions of machining were studied. Data are charted. (G17, Q24, Al)

172-G. (Book) **Die Stanz-Ersetztechnik in der Fein-Mechanischen Fertigung.** (The Technique of Precision Press Work.) Paul Gabler. 198 pages. Carl Hanser Verlag, Munich 27, Germany. \$5.00.

Tooling for making precision stampings. Plastic flow in press-work. Includes sketches of tools and parts, plus tabular data. (G1)

173-G. **Methods of Machining and Grinding Stellite; Techniques Employed by Deloro Stellite, Shirley, Birmingham.** *Machinery* (London), v. 80, Feb. 14, 1952, p. 274-279. (G17, Co)

174-G. (Book) **Kholodnaya Obrabotka Metalla Uprochnialushche-Kalibrushchim Instrumentom.** (Cold Working of Metals by Means of a Hardening and Calibrating Tool.) V. O. Voishko. 83 pages. 1950. State Scientific-Technical Publishing House for Machine Construction Literature Moscow and Leningrad, U.S.S.R.

A method of finishing the surface of parts without removing chips, by knurling and flattening with rollers. Basic processes taking place in the metal during its deformation; influence of temperature, and of geometry of the rolls, and their influence on the worked surface. The problems of increasing fatigue strength and finish, treatment under com-

pression, increased wear resistance, and measurement of forces during knurling. Behavior of several non-ferrous metals, with attention largely confined to various steels. Graphs, tables, diagrams, and illustrations. 38 ref. (G general, Q general)

H POWDER METALLURGY

28-H. **Heat Resisting Sintered Aluminum.** R. Irmann. *Engineers' Digest*, v. 13, Jan. 1952, p. 9-12.

Previously abstracted from *Revue de l'Aluminium*. See item 2-H, 1952. (H general, Al)

29-H. **Powder Metallurgy Produces a Brass Ordnance Component; the Full Case History of an Important Piece.** John Dale. *Precision Metal Molding*, v. 10, Feb. 1952, p. 34-36, 69-72. Problems and techniques used in the production of brass rotors. Micrographs. (H general, Cu)

30-H. **Design Data for Low Density Iron Powder Parts.** *Precision Metal Molding*, v. 10, Feb. 1952, p. 43-44, 77-79. Methods of making iron compacts. Mechanical properties of sintered Fe compacts. (H general, Q general, Fe)

31-H. **Powder Metallurgy's Contribution to High-Temperature Materials.** H. W. Greenwood. *Metal Treatment and Drop Forging*, Feb. 1952, p. 75-80. Development of powdered metals and their application during recent years. Research necessary for future development in certain promising fields. (H general, T general)

32-H. **Powdered Metals for Hotter Jets.** *Business Week*, Mar. 1, 1952, p. 94-96.

How turbine wheels for jet engines can be fabricated through powder metallurgy. (H general, T25, SG-h)

33-H. **Mechanical Precision of Parts Obtained by the Powder Metallurgy Process.** R. Girshig. *Microtechnic*, (English Ed.), v. 5, Nov.-Dec. 1951, p. 345-350; disc., p. 351-352. (Translated from the French.)

An evaluation of the process with a review of briquetting, sintering, and sizing. (H general)

34-H. **Synthesis of Two Copper Tellurides by Compression of Crystalline Copper and Tellurium Powders.** (In French.) Raymond Hocart and Roger Molé. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 2, 1952, p. 111-113.

By means of uni-axial compression at 3500-17,500 kg. per sq. cm., two crystalline phases were obtained; in each case a weissite-type phase, and in some cases a ricardite-type phase. (H14, M26, Cu, Te)

35-H. **Powder Metallurgy.** (In German.) Part I. The Present Technical and Economic Status of Powder Metallurgy. R. Keiffer. Part II. The Scientific Fundamentals of Powder Metallurgy. G. F. Hüttig. *Angewandte Chemie*, v. 64, Jan. 21, 1952, p. 41-54. Includes numerous graphs, tables, and illustrations. 84 ref. (H general)

36-H. **Physical Characteristics of Fine-Grained Crystalline Bodies in Connection With Reactions in Their Mixtures.** (In Russian.) A. N. Ginstling. *Zhurnal Prikladnoi Khimii*, v. 24, June 1951, p. 566-575.

A study was made of solid-state reactions. One of the basic factors determining reaction rates of powdered nonmetallic mixtures is the area of contact between the particles. Emphasis is on nonmetallic compounds but metallic materials are also mentioned. Data are tabulated. 15 ref. (H11, P13)

HEAT TREATMENT

71-J. Continuous Annealing System Combines Several Operations. *Inco Magazine*, v. 25, Winter 1951-52, p. 15, 27.

Continuous strip annealing process at the American Brass Co.'s new brass mill in Buffalo, N. Y. Production of annealed brass strip is accomplished by integrating a number of operations into one continuous system that may be readily controlled. (J23, F23, Cu)

72-J. Forced Air Circulation for Low-Temperature Heat Treatment. *Sheet Metal Industries*, v. 29, Feb. 1952, p. 124-126.

Furnaces and equipment used for heat treatment up to 700° C. (J general)

73-J. Summary of Progress on Investigation of Stress Relaxation in Rail Steel. D. R. Jenkins and H. J. Grover. *American Railway Engineering Association Bulletin*, v. 53, Feb. 1952, p. 916-920.

An investigation to determine possibilities of alleviation of residual stress or fatigue damage by heating rail steel to subcritical temperatures. (J1, CN)

74-J. Prepared Atmospheres—Their Generation and Application: II. C. George Segeler. *Industrial Heating*, v. 19, Feb. 1952, p. 226, 228, 230, 232, 234, 244.

Some of the practical complications which arise, and means for checking atmospheres before trouble begins. The effect of such factors as purification, oxidation, sooting, and contamination on atmosphere operation. (J2)

75-J. An Investigation of the Quenching Characteristics of a Salt Bath. M. J. Sinnott and J. C. Shyne. *Industrial Heating*, v. 19, Feb. 1952, p. 236, 238, 240.

See abstract from American Society for Metals, Preprint 29, 1951, item 223-J, 1951. (J2, SS)

76-J. Coil Annealing. Lee Wilson. *Iron and Steel Engineer*, v. 29, Feb. 1952, p. 66-72; disc., p. 72.

Use of single-stack annealing furnaces. Advantages. (J23)

77-J. Electric Furnaces for the Thermal Treatment of Non-Ferrous Metals and Alloys. C. J. Evans, P. F. Hancock, F. W. Haywood, and J. McMullen. *Journal of the Institute of Metals*, v. 80, Feb. 1952, p. 255-256.

Reviews types of furnaces available for thermal treatment of light alloys, Cu and Ni. Use of controlled atmospheres. Emphasis is on furnaces of highly specialized design, which work in conjunction with production lines.

(J general, Al, Mg, Cu, Ni)

78-J. Gas Equipment for the Thermal Treatment of Nonferrous Metals and Alloys. J. F. Waight. *Journal of the Institute of Metals*, v. 80, Feb. 1952, p. 269-285.

Burner systems in common use in the nonferrous metal industry, with emphasis on automatic mixture-control devices, also furnace atmospheres. A catalytic sulfur-removal plant suitable for bright annealing furnaces. A number of furnace installations illustrate application of the various burner systems, and also the use of mechanical handling equipment. These installations include a copper billet heating furnace, tube annealing furnaces, and a cover furnace. In the field of light metals, billet heating furnaces, salt baths, and forced-circulation hot air furnaces are discussed.

(J general, F21, EG-a)

79-J. Batch and Continuous Annealing of Copper and Copper Alloys. Edwin Davis and S. G. Temple. *Journal of the Institute of Metals*, v. 80, Feb. 1952, p. 287-296.

Changes in annealing equipment and practices in the production of wrought Cu and Cu alloys. Annealing characteristics of representative Cu-base alloys. Effect of impurities on the softening of Cu alloys. Heat treatment other than annealing to produce soft material, such as stress-relief annealing, solution heat treatment, and tempering. Various types of batch and continuous furnaces, and factors influencing uniformity of annealing. Relative merits, limitations, and applications of both types of annealing. (J23, Cu)

80-J. Bright Annealing of Nickel and Its Alloys. H. J. Hartley and E. J. Bradbury. *Journal of the Institute of Metals*, v. 80, Feb. 1952, p. 297-310.

Historical development. Conditions which must be fulfilled in different cases are reviewed from a theoretical standpoint. Variations in requirements of different alloys and effects of S and C in the annealing atmospheres. Clean annealing in belt-conveyor furnaces. Production of sulphur-free atmospheres from town gas. Methods of testing the suitability of purging-gas atmospheres for use in annealing these alloys, including a method which avoids dew-point measurements. (J23, Ni)

81-J. Batch Thermal Treatment of Light Alloys. C. P. Paton. *Journal of the Institute of Metals*, v. 80, Feb. 1952, p. 311-322.

The processes of annealing, solution treatment, precipitation treatment, stabilization, and the principal differences in thermal conditions which they entail. Factors affecting the choice of a furnace, such as fuels, heating media, circulation of heating media, furnace atmospheres, temperature measurement and control, quenching and drying, general handling, and constructional materials. Current batch furnace design is criticized. Data for Al and some of its alloys. (J27, Al)

82-J. Flash Annealing of Light Alloys. R. T. Staples. *Journal of the Institute of Metals*, v. 80, Feb. 1952, p. 323-334.

Results obtained from treatments carried out on light alloys in a flash annealing furnace show that a wide range of thermal treatments can be successfully accomplished. The theoretical case in favor of employing high rates of heating to secure a fine grain size on recrystallization is supported by evidence obtained in industrial practice. Factors governing the design of a single-sheet, conveyor-type furnace. Performance data for Al and a few of its alloys. 16 ref. (J23, Al)

83-J. Continuous Heat Treatment of Aluminium Alloys of the Duralumin Type. Marcel Lamourdedieu. *Journal of the Institute of Metals*, v. 80, Feb. 1952, p. 335-339.

A plant designed for the continuous heat treatment of Duralumin-type alloys. Results of some tests on 24S Alclad. (J27, Al)

84-J. Automatic Control of Gas-Fired Heat Treatment Furnaces. Leo Walter. *Machinery* (London), v. 80, Feb. 14, 1952, p. 284-287.

Process-cycle control which enables heat treatments to be carried out in accordance with a predetermined time-temperature curve—for example, with a gradually rising temperature, followed by soaking, and a cooling period. The relative lengths of these periods can be varied at will, according to requirements. (J general, S18)

85-J. Induction Heating for Continuous Heat Treatment of Sheet and Strip. F. C. Hull and Howard Scott. *Metal Progress*, v. 62, Feb. 1952, p. 57-61.

Results of investigations. Materials studied were low-carbon steel, 70-30 brass, 18-8 stainless steel, and Al alloys. (J23, J27, CN, Cu, SS, Al)

86-J. Continuous Furnace for Fast Annealing of Tin-Plate. M. D. Stone and E. A. Randich. *Metal Progress*, v. 62, Feb. 1952, p. 62-66.

Results of an investigation on the above. Heat treatment furnace is diagrammed. (J23, CN)

87-J. Stress Relief in Magnesium Castings. *Metal Progress*, v. 62, Feb. 1952, p. 124, 126, 128. (Condensed from "Stress Relief and Allied Problems in Magnesium Alloy Castings", R. J. M. Payne.)

Previously abstracted from *Journal of the Institute of Metals*. See item 49-J, 1951. (J1, Mg)

88-J. The Function of Energizers in Pack Carburizing. (In Swedish.) Axel Hultgren. *Jerkontorets Annaler*, v. 135, No. 11, 1951, p. 575-604.

Upon study of the various ways in which the energizers K_2CO_3 , Na_2CO_3 , and $BaCO_3$ may be placed in the carburizer box with crushed charcoal and the objects to be carburized, two methods were found to give the same results as mixing charcoal and energizer: K_2CO_3 or Na_2CO_3 applied separately, e.g., as a layer on top of the charcoal; and $BaCO_3$ applied as a thin coating on the steel surface, preferably with the aid of a binding agent. The coated specimens were packed in unmixed charcoal which had been washed thoroughly with dilute HCl. In carrying out the carburizing process on $BaCO_3$ -coated steel objects, the presence of a small amount of K_2CO_3 in the charcoal or in the coating may interfere with the carburizing reaction in some unknown manner. Apparatus is diagrammed; data are tabulated. (J28, ST)

89-J. Continuous Bright-Annealing Furnace. *Engineering*, v. 173, Feb. 15, 1952, p. 223.

Includes illustration of a furnace used by a British firm for small-parts annealing. (J23)

90-J. Heat Treating Automotive Steering Assemblies. George Goepfert. *Steel Processing*, v. 38, Feb. 1952, p. 82-87, 101.

See abstract of "High Production Heat Treatment of Steering Gear Parts," *Automotive Industries*; item 35-J, 1952. (J general, AY)

91-J. Metallography and Modern Heat Treatments of Special Steels. (In French.) André Michel. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 853-855, 857, 859-861, 871.

Isothermal annealing, interrupted quenching, austempering, subzero treatment, tempering, stabilization by aging, and thermal stress relief. Diagrams and tables. (J general, N8, AY)

92-J. Case-Hardening. (In French.) Marcel Guedras. *Métallurgie et la Construction Mécanique*, v. 83, Dec. 1951, p. 997, 999-1001.

The metal, the case hardening compound, case hardening boxes, temperature, tempering, and causes of low surface hardness. (J28, ST)

93-J. Annealing of High-Strength Welds on Steam Generators. (In German.) A. Krause. *Brennstoff-Wärme-Kraft*, v. 4, Feb. 1952, p. 44-47.

Metallurgical principles of annealing, and annealing of a series of welds on closed vertical tubes. Development of suitable burners. Useful instrument for controlling the annealing operation. Photomicrographs, photographs, graphs, and tables. (J23, AY)

94-J. Flame Hardening of the Leading Edges of Steam Turbine Blades. (In German.) F. J. Overkott. *Brennstoff-Wärme-Kraft*, v. 4, Feb. 1952, p. 47-49.

Impact of droplets of condensation was found to reduce the life of turbine blades made of Cr steel. This difficulty can be reduced by reducing steam condensation and by flame-hardening the leading edges of the blades. Graphs, photographs, and photomicrographs. (J2, S21, AY)

95-J. Soft Annealing of High-Carbon Steels With Isothermal Transformation. (In German.) Walter Hulsbruch and Erich Theis. *Stahl und Eisen*, v. 72, Jan. 31, 1952, p. 123-131; disc., p. 131-133.

A method designed to yield a uniformly annealed structure with purely spherical cementite in steels. Tests on steel with varying amounts of Cr to determine effects of annealing temperature, annealing time, and rate of cooling. Economic and furnace-design problems. Tables, graphs, and micrographs. (J23, N3, CN)

96-J. (Book) Schnellstahl und ihre Wärmebehandlung. (High Speed Steel and Its Heat Treatment.) Willi Haufe. 276 pages. 1951. Carl Hanser Verlag, Munich 27, Germany. 29 D.M.

Considers not only the high-tungsten steel, but also the newly developed low-tungsten high speed steels containing less than 14% W. The influence of individual alloying elements on the properties of high speed steels, such as hot strength, tempering resistance, and wear resistance. Questions of heat treatment, etc., are dealt with from the user aspect. Surface treatments are also described. (J general, Q general, L general, TS)

K

JOINING

181-K. Glass Tube Technology. 1. Glass-to-Metal Seals. Peter Whibley. *Engineering Experiment Station News* (Ohio State University), v. 23, Dec. 1951, p. 48-51, 55-56.

Data on metal and glasses suitable for sealing. Stresses resulting from differential contraction between glass and metal. (K11, Q25)

182-K. Increase in Adhesion of Shrink Fits by Surface Oxidation. F. Wenck. *Engineers' Digest*, v. 13, Jan. 1952, p. 13-15, 28. (Translated and condensed from *Werkstattstechnik und Maschinenbau*, v. 41, Sept. 1951, p. 359-361.)

Influence of surface layers on shrink fits subjected to torsional load. Evidence is submitted on the decrease of adhesion due to oil films on the steel surfaces and on the increase due to oxide layers. (K13, ST)

183-K. Welding Magnesium Alloys. *Magazine of Magnesium*, Feb. 1952, p. 1-7.

Mg and all of its commonly used alloys can be welded by gas, arc, and electric resistance methods. The different methods of welding, and some of the important characteristics of Mg which affect welding. (K general, Mg)

184-K. Some Details of Multi-Spot Welding Technique as Practised at the Luton Plant of Vauxhall Motors Ltd. A. J. Newson. *Sheet Metal Industries*, v. 29, Feb. 1952, p. 149-157.

Includes a brief outline of press welding and the possibilities of this method of production. Diagrams. (K3)

185-K. Thoriated-Tungsten Electrodes—Their Welding Characteristics and Applications. G. J. Gibson and R. O. Seitz. *Welding Journal*, v. 31, Feb. 1952, p. 102-108.

The theory of arc welding is examined to determine the difference between the action of thoriated and pure-tungsten electrodes. Application to various ferrous and nonferrous metals and alloys. Data are charted and tabulated. (K1, T5)

186-K. Flash Welding of Components for Aircraft and Similar Applications. J. H. Cooper. *Welding Journal*, v. 31, Feb. 1952, p. 109-115.

Process characteristics. The greater proportion of the materials welded are a group of related alloy steels such as SAE 4130, 4135, 4140, 4340, 8740; AMS steels 6371, 6324, 6413, 6359-A, etc. (K3, AY)

187-K. How to Braze Weld Cast Iron. H. D. Drummond. *Welding Journal*, v. 31, Feb. 1952, p. 148-151.

Outlines procedure. (K8, CI)

188-K. A Study of the Fatigue Strength of Welded Joints. *Welding Journal*, v. 31, Feb. 1952, p. 100S-103S. (Translated and condensed from "Fatigue Strength of Welded Assemblies," W. Soete and R. Van Crombrugge.)

Previously abstracted from *Revue de la Soudure*; *Lastijdschrift*. See item 593-K, 1951. (K9, Q7, ST)

189-K. The Practical Testing of the Cohesive Strength and Weldability of Steels. W. A. Felix. *Welding Journal*, v. 31, Feb. 1952, p. 105S-111S.

Various testing methods employed for investigating the suitability of a steel for use in highly stressed welded structures. (K9, S1)

190-K. Report of Special Committee on Continuous Welded Rail. H. B. Christianson, chairman. *American Railway Engineering Association Bulletin*, v. 53, Feb. 1952, p. 683-693.

Fabrication, laying, fastenings, and maintenance. Subcommittee reports on each topic. (K general, T23, CN)

191-K. Guided Bend Qualification Test. R. G. Alison. *Canadian Metals*, v. 15, Feb. 1952, p. 40, 42.

Electrode and plate materials as factors in the success of the test. (K9, ST)

192-K. Oxy-Argon Mixture for Improved Sigma Welding. *Canadian Metals*, v. 15, Feb. 1952, p. 54.

Lower current densities, more economical rods, and welding of thinner materials. Use improves the welding of stainless and carbon steels. (K1, SS, CN)

193-K. Fabricated Ingot Cars Stand Up Under Severe Operating Conditions. R. G. Fournie. *Iron Age*, v. 169, Feb. 28, 1952, p. 112-114.

Arc welding procedures for plain carbon steel cars designed to withstand severe impact loads at elevated temperatures. (K1, CN)

194-K. Fabrication of Aluminum "Skybeams". *Light Metal Age*, Feb. 1952, p. 8-9.

Spot welding of structural Al floor beams of remarkably high strength-weight characteristics, by Ryan Aeronautical Co. 1000 weightless spot welds are employed in each of the I-beams which support the cargo-carrying floors of the big Boeing C-97 Strato-Freighter. (K3, T24, AI)

195-K. Welded Fixtures Expedite Machining of Die Castings. Herb Downing. *Machine and Tool Blue Book*, v. 48, March 1952, p. 235-236, 238, 242, 244.

Fixtures are assembled by arc welding. (K1, G17)

196-K. Resistance Welding Operations on Girling Shock Absorbers. *Machinery* (London), v. 80, Feb. 7, 1952, p. 229-232.

Welding machines work on a 2-phase balanced load system, and the

welding cycle is controlled by ignition equipment providing phase-shift heat regulation, the heating time being approximately 0.1 sec. (K3, ST)

197-K. Nested Electrode Welding. *Metal Progress*, v. 62, Feb. 1952, p. 150, 152. (Condensed from "Nested Electrodes for Metal Arc Welding", William A. Snyder.)

Previously abstracted from *Welding Journal*. See item 23-K, 1952. (K1)

198-K. Welding Facilitates Construction of Refrigerated Carbonating Equipment. *Refrigerating Engineering*, v. 60, Feb. 1952, p. 153, 190.

Welding of a stainless steel cooling unit and tank with hand or automatic hidden-arc equipment. (K1, SS)

199-K. Notes on Soldering. Lester F. Spencer. *Sheet Metal Worker*, v. 43, Feb. 1952, p. 33, 49-50.

Nominal composition of various alloys, and their melting range. Various uses of each. (K7, SG-f)

200-K. How Welding Can Assist in Achieving Metal Economy. J. W. Shedden. *Welder*, v. 20, July-Dec. 1951, p. 27-31.

The raw-materials position, and savings of metal by changes to welded designs. 12 ref. (K general)

201-K. The Restoration of Mill Hammers by Welding. L. G. Kent. *Welder*, v. 20, July-Dec. 1951, p. 33-34. (K general, CN)

202-K. Recent Developments in the Welding of Steam Locomotive Components. H. H. Mackintosh. *Welder*, v. 20, July-Dec. 1951, p. 35-37.

Brief discussion and illustrations. (K general, T23, CN)

203-K. The Design and Fabrication of Welded Structures Subjected to Repeated Loading. Part VIII. *Welder*, v. 20, July-Dec. 1951, p. 38-41.

Compares properties of butt welds and reinforced butt welds; effect of shape and machining on fatigue strength of straps attached by fillet welds. (To be continued) (K general, Q7, CN)

204-K. The New Murex Cleat Jig. *Welder*, v. 20, July-Dec. 1951, p. 42-44.

Advantages of joining steel parts by welding instead of riveting or bolting. (K general, ST)

205-K. Building Jaguar Sports Cars. *Welding and Metal Fabrication*, v. 20, Feb. 1952, p. 44-48.

Various welding, brazing, and pressing operations. (K general, G1, CN)

206-K. Industrial Brazing. Heating Methods and Equipment. E. V. Beatson and H. R. Brooker. *Welding and Metal Fabrication*, v. 20, Feb. 1952, p. 54-58.

Various types of furnaces and furnace atmospheres for brazing. Graphs and tabular data. (To be continued.) (K8)

207-K. Some Aspects of Prefabrication in Ship Construction. N. G. Eckert. *Welding and Metal Fabrication*, v. 20, Feb. 1952, p. 63-69.

Emphasis is on welding, design, and scheduling. (K general, T22, CN)

208-K. Making Satisfactory Welded Joints in Wire by Resistance Welding. *Wire and Wire Products*, v. 27, Feb. 1952, p. 161-163, 210-213.

The underlying principles and factors that should be understood if welded joints of optimum quality are to be produced. Materials considered are cold and hot drawn low-carbon steel wire. (K3, ST)

209-K. High-Temperature Welded Joints. R. H. English. *Australasian Engineer*, Jan. 7, 1952, p. 147-151.

Previously abstracted from *Welding Journal*. See item 619-K, 1951. (K1, SS, SG-h)

210-K. Welding Jet Engine Parts of Heat Resistant Metals. J. L. Solomon. *Automotive Industries*, v. 106, Mar. 1, 1952, p. 41, 58.

Fabrication of jet-engine parts composed of mild steel with Al coating, Ni alloys, W-bearing austenite, stainless, Ti, and martensitic stainless. Problem of welding similar materials having different rates of thermal conductivity.

(K general, CN, Ni, Ti, SS, Al)

211-K. Silicone Rubber Can Now Be Bonded. Robert Smith-Johannsen. *General Electric Review*, v. 55, Mar. 1952, p. 54-57.

Includes tabular data showing what silicone to use for specific adhesive purposes for glass, ceramics, and metals. (K12)

212-K. Fastening Heavy Parts by Stud Welding. *Industry and Power*, v. 62, Mar. 1952, p. 95.

A brief discussion of the process. (K1)

213-K. Induction Heater Cuts Tool Costs. Elroy Fellwock. *Iron Age*, v. 169, Mar. 6, 1952, p. 223.

Repair of broken carbide tools by electronic induction brazing at 55-75% below the cost of replacing damaged tools with new ones. (K8, C-n)

214-K. Production Problems. XIII: Welding of Tractor Steering Wheels. *Iron & Steel*, v. 25, Feb. 1952, p. 46-48, 61.

The three spokes of steel tractor wheels were joined to the center boss by projection welding. An investigation was made of the failure in the brittle zone adjacent to the weld but not in the weld itself, and failure in the actual weld. Micrographs. (To be continued)

(K3, Q23, ST)

215-K. Welding Aluminum Ship Structures. *Marine Engineering and Shipping Review*, v. 57, Mar. 1952, p. 86.

Some aspects to be considered. (K general, T22, Al)

216-K. Progress in Welding Light Alloys. P. T. Houldcroft. *Metallurgia*, v. 45, Feb. 1952, p. 81-84.

Development of the gas-shielded arc welding process which uses consumable electrodes. Improved materials. 11 ref. (K1, Al, Mg)

217-K. Spot Welding in Aircraft Assembly. *Modern Metals*, v. 8, Feb. 1952, p. 37-38.

Techniques used by the Ryan Aeronautical Co., San Diego, Calif. Describes "Raco 220", a non-abrasive cleaner for Al. (K3, L12, Al)

218-K. Welded Construction Reduces Pump Weight. *Product Engineering*, v. 23, Mar. 1952, p. 142-143.

New 500-hp. slush pump using a welded steel design to reduce weight without sacrificing strength or performance. (K general, ST)

219-K. Spot Welding Highly Stressed Aluminum and Magnesium Assemblies. A. Schoellerman and S. Jenkins. *Product Engineering*, v. 23, Mar. 1952, p. 185-188.

Design considerations, mechanical properties, weldability of Al alloy combinations, and weld spacing and dimensions for Al and Mg assemblies. (K3, Q general, Al, Mg)

220-K. Welding Procedures for Copper-Base Alloys. Lester F. Spencer. *Welding Engineer*, v. 37, Mar. 1952, p. 17-22.

Preliminary considerations such as joint preparation, back-up bars, etc., and the fusion welding of pure Cu, Be-Cu, and the Cu-Zn alloys. (To be continued.) (K general, Cu)

221-K. Stud Welding Freight Cars. *Welding Engineer*, v. 37, Mar. 1952, p. 30-31, 34.

The process and its advantages. (K1, CN)

222-K. Better Dipper Sticks by Submerged-Arc Welding. *Welding Engineer*, v. 37, Mar. 1952, p. 32-34.

Welding of power-shovel parts

which involves welding of tubes 20 in. in diam. and up to 45 ft. long with mobile apparatus. (K1, CN)

223-K. Houston's New Welded Office Building. T. B. Jefferson. *Welding Engineer*, v. 37, Mar. 1952, p. 35-37.

Operations and problems in construction of 22-story welded steel structures. (K1, T26, CN)

224-K. Designing a Welded Bucket Dredge. (In German.) Raimund Pertusini. *Schweisstechnik*, v. 5, Dec. 1951, p. 133-136.

Considerable material can be saved by welding, rather than riveting or casting, the parts of a dredge. (K general, T4, CN)

225-K. Outside Shell Assemblies. (In German.) Raimund Pertusini. *Schweisstechnik*, v. 5, Dec. 1951, p. 137-138.

Cost studies of the assembling of ship shells by riveting, fillet welding, shot welding, and spot welding show that spot welding is by far the cheapest method of assembling the shell parts. Diagrams and tables. (K general, K3, CN)

226-K. Use of Steel in Pressure Pipe Lines. (In French.) D. Cecchi. *L'Ossature Metallique*, v. 16, Dec. 1951, p. 580-582.

Italian work, especially in connection with arc welding of steel pipes. Macrographs show structures of the weld zones. (K1, M28, CN)

227-K. Welding of High-Alloy Acid-Proof, and Non-Sealing Ferritic and Austenitic Steels. (In German.) Ernst Kloss. *Chemie-Ingenieur-Technik*, v. 24, Jan. 1952, p. 12-18.

General rules for the weldability of the various types mainly used in the chemical industry. (K9, SS)

228-K. Suitability of Steels for the Flash-Butt Welding Method. (In German.) Erich Hormann. *Stahl und Eisen*, v. 72, Jan. 3, 1952, p. 19-24.

Examples of material and time savings by application of above process to complex sections. Effects of welding conditions on tensile strength and bending angle of flash welded tubes of hydrogen-resistant steels. Application of inert-gas-shielded arc welding to Cr and Mo steels. Occurrence of microcracks near the weld. Micrographs and macrographs. (K3, K1, Q general, AY, SS)

229-K. Deformation During Welding of Structures of High Buildings. (In Russian.) A. D. Zevin. *Avtojennoe Delo*, v. 22, May 1951, p. 3-6.

Experiments were made with aim of reducing the influence of deformation during welding on the building structures. (K general, T26, CN)

230-K. Automatic Welding of Edge Seams With a Carbon Arc Stabilized With a Jet of CO₂. (In Russian.) N. G. Ostapenko. *Avtojennoe Delo*, v. 22, May 1951, p. 6-9.

The conditions for satisfactory application of the method to carbon steels. (K1, CN)

231-K. Weldability of Aluminum-Magnesium Alloy. (In Russian.) S. V. Avakian and N. F. Lashko. *Avtojennoe Delo*, v. 22, May 1951, p. 9-13.

A study was made of welds in Al-Mg alloys. The formation of porosity and structural changes occurring during various heating and cooling cycles were investigated. (K9, Al)

232-K. La Construcción Mecánica Soldada. (Welded Machine Construction.) *Instituto de la Soldadura* (Madrid). Publication 20, 1951, p. 27-40.

Reasons which determine the choice of welding technique to be used in construction of machines, details to be considered in drawing up plans and directing their execution, and the technological study of arc welding electrodes. Photographs and sketches. (K general, K1)

233-K. Progreso de la Soldadura. (Developments in Welding.) F. Guyot.

Instituto de la Soldadura (Madrid). Publication 20, 1951, p. 5-26.

A general review, covering various aspects such as base metal, weldability, electrodes for arc welding, and various welding processes (arc welding, gas welding, resistance welding, and hard soldering). Tables, diagrams, photographs, and charts. (K general)

CLEANING, COATING AND FINISHING

228-L. Special Dip Routine Bans Weekend Rust. *American Machinist*, v. 96, Feb. 1952, p. 143.

How surfaces of steel gears, shafts, and other parts are protected against corrosion for up to 2 months in 95% humidity conditions at Boston Gear Works. A water solution of a nitrite chemical called "VPI," and made by Shell, proved to be the answer to the problem. (L14, ST)

229-L. Hamilton Mfg. Co. Enjoys Full Operation of Metal Treatment and Finishing Plant. *Industrial Gas*, v. 30, Feb. 1952, p. 7, 25-27.

The steel finishing department. Metal preparation, finishing, and high-temperature baking of final finish. (L general, ST)

230-L. Phosphate Coatings as a Basis for Painting Steel. *Journal of the Iron and Steel Institute*, v. 170, Jan. 1952, p. 10-15.

Results obtained when analytical and performance tests were applied to industrial phosphate coatings. (L14, ST)

231-L. Tentative Analytical Tests for Phosphate Coatings on Steel. R. St. J. Preston, R. H. Settle, and J. B. L. Worthington. *Journal of the Iron and Steel Institute*, v. 170, Jan. 1952, p. 19-20.

Details of laboratory tests to determine the nature and uniformity of phosphate coatings. The tests consist of the measurement of moisture content, absorption, coating weight, hygroscopicity, and phosphate and chromate contents of the coatings. (L14, S11, ST)

232-L. For Non-Glare Surfaces: Wrinkle Paint Applied to Die Castings by Electrostatic Spray. *Precision Metal Molding*, v. 10, Feb. 1952, p. 47-49, 51.

Techniques used by Burroughs Adding Machine Co. of Detroit to obtain a uniform coating of wrinkle paint with controlled pattern. (L26)

233-L. Spray Finishing Automotive Parts Automatically. Frank L. Beonem. *Products Finishing*, v. 16, Feb. 1952, p. 20-28, 30.

Procedures at Randall Co., Wilmington, Ohio. Parts are fabricated from cold rolled or commercial deep drawn steel. (L26, ST)

234-L. Bright Dipping Brass Compacts. Marvin Rubinstein. *Products Finishing*, v. 16, Feb. 1952, p. 34-40, 42, 44, 46, 48.

Summary of procedures. (L12, Cu)

235-L. Spotlighting Finishing Progress: Properties of Chromium Plate. Allen G. Gray. *Products Finishing*, v. 16, Feb. 1952, p. 54, 56, 58, 62, 64, 68, 70, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92.

Reviews recent work on properties of Cr plate; factors affecting the quality of lacquer coatings; pickling and etching Al alloys; and mechanical finishing of Mg parts. (L general, Cr, Al, Mg)

236-L. Infra-Red Lamps at Work. Carl E. Egeler. *Products Finishing*, v. 16, Feb. 1952, p. 94-96, 98.

Advantages for baking, heating,

and drying. Factors involved in design and application. (L26)

237-L. A Theory of the Mechanism of the Formation of Zinc Coatings During Galvanizing. H. Bablik, F. Götzl, and R. Kukaczka, *Sheet Metal Industries*, v. 29, Feb. 1952, p. 173-174.

Attempts to prove that the influence of chemical additions to the iron also result in a disturbance of the base metal, that is, by increasing the area of the reacting surface. (L16, CN, Zn)

238-L. Alternatives to Nickel-Chromium Plating; Report on Contributions to Birmingham Meeting of the Institute of Metal Finishing. *Sheet Metal Industries*, v. 29, Feb. 1952, p. 175-177.

Bright Zn plating, Cr on Cu, Sn-alloy plating, and colorless lacquers as plating reinforcements. (L17, Cr, Ni, Cu, Sn, Zn)

239-L. Source of Defect-Producing Hydrogen in Porcelain-Enameled Steel. *Technical News Bulletin* (National Bureau of Standards) v. 36, Feb. 1952, p. 24-25.

Previously abstracted from "Relative Importance of Various Sources of Defect-Producing Hydrogen Introduced Into Steel During the Application of Porcelain Enamels," D. G. Moore, Mary A. Mason, and W. N. Harrison. *Journal of the American Ceramic Society*; item 163-L, 1952. (L27, ST)

240-L. Crusher Parts Made Tougher by Hard Facing Using Submerged Arc Welding. *Welding Journal*, v. 31, Feb. 1952, p. 152.

Procedures used by Finning Tractor and Equipment Co., Ltd., Vancouver, B. C., in rebuilding Mn steel crusher cones and mantles. (L24, AY)

241-L. Applied Radioisotopes. *Canadian Metals*, v. 15, Feb. 1952, p. 36, 38-39.

Use of heavy hydrogen in revealing the source of H₂ which produces defects in porcelain-enameled steels. Dissolved H₂O in the frit was found to be the largest source. Work was done at National Bureau of Standards. (L27, S19, ST)

242-L. Chromium Plating; Development and Commercialisation of the Process. Part II. The Chromium Plating Solution. *Electroplating and Metal Finishing*, v. 5, Feb. 1952, p. 47-49.

Possibilities for development of radically different types of solution based on chromous, chromic, or complex Cr compounds. (L17, Cr)

243-L. Anodizing Small Parts; Special Facilities Available to Industry. *Electroplating and Metal Finishing*, v. 5, Feb. 1952, p. 54-55.

Process and layout at Scrib Ltd., Brimsdown, Middlesex, for color anodizing small Al articles of round or substantially tubular shape. (L19, Al)

244-L. Zinc Spraying: Technique and Applications in France. F. Hedde. *Electroplating and Metal Finishing*, v. 5, Feb. 1952, p. 71-72. (Condensed from *Bulletin de Documentation Technique*, Feb. 1951.)

A post-spraying technique, typical metallizing costs, and applications of Zn spraying made in certain branches of French industry. Only the wire pistol is dealt with. The principal physical characteristics of sprayed Zn coatings are summarized. (L23, Zn)

245-L. Coating Thin Sheet Metal to Be Formed Into Caps and Containers. Charles R. Bragdon. *Industrial Finishing*, v. 27, May 1951, p. 32-34, 36, 38, 40, 42, 44, 46. (Condensed from *Interchemical Review*, v. 9, Autumn 1950, p. 43-53.)

Methods and problems involved in rapidly applying and drying thin protective inside linings and decorative outside coatings to sheet metal which is later machine cut and

AMERICAN CHEMICAL PAINT COMPANY

AMBLER  PENNA.

Technical Service Data Sheet

Subject: RUST PROOFING WITH PERMADINE®

INTRODUCTION:

Ferrous metal parts that have been Permadiized in a zinc phosphate chemical solution and then "sealed" with a rust-preventive oil such as "Granoleum" are effectively protected from rust-damage. In addition, if the surface is accidentally chipped or scratched, rusting is confined to the exposed area.

Rust proof coatings find many practical applications. During World Wars I and II most small arms were rust proofed by phosphate coating and impregnated with chromic acid and a rust preventive oil, or cutback petrolatum. This not only provided excellent corrosion resistance but also yielded a dull black non-reflecting surface. Rust proof finishes are now used widely on hardware, firearms, cartridge clips, metallic belt links, miscellaneous forgings and castings, tools, unpainted replacement machine parts, and many other similar items such as bolts, nuts, and washers.

THE PERMADIZING PROCESS:

For the most effective rust proofing of large or small work in large or small production, "Permadiene" is used in tanks in an immersion process, with the bath heated to 190°-210°F., coating time 20 to 30 minutes. The coated parts are then rinsed in clean water, and then in a controlled dilute acidulated solution. After drying, a suitable corrosion-resistant oil such as "Granoleum" is applied.

Operations can be carried out with the work in crates, or hung from hooks, utilizing an overhead rail and hoists. For large volume production, automatic equipment can be used to mechanize the line. Small parts can be treated in tumbling barrels.

"PERMADINE"

MEETS

SERVICE

SPECIFICATIONS:

The protective "Permadiene" finish meets U.S.A. 57-0-2C; Type II, Class B, and equivalent requirements of:

MIL-C-16232,

Type II

U.S.A. 51-70-1,

Finish 22.02, Class B

AN-F-20

Navy Aeronautical M-364

JAN-L-548

"PERMADINE" DATA CHART

Type of coating	Zinc phosphate
Object of coating	Rust and corrosion prevention
Typical products treated	Nuts, bolts, screws, hardware items, tools, guns, cartridge clips, fire control instruments, metallic belt links, steel aircraft parts, certain steel projectiles and many other components
Scale of production	Large or small volume; large or small work
Method of application	Dip Barrel tumbling, racked or basketed work
Equipment notes	Immersion tanks of suitable capacity. Cleaning and rinsing stages can be of mild steel. Coating stage can be of heavy mild steel or stainless steel.
Chemicals required	"Permadiene" No. 1
Pre-cleaning methods	Any common degreasing method can be used. Alkali cleaning ("Ridosol"), Acid cleaning ("Deoxidine"), Emulsion-alkali cleaning ("Ridosol"), "Ridoline"; vapor degreasing, solvent wiping, etc., are examples. Acid cleaning may need to follow other cleaning methods if rust or scale is present.
Bath Temperature	190° - 210°F.
Coating time	20 - 30 minutes
Coating weight range Mgs./Sq. Ft.	1000 - 4000
Technical Service Data Sheets	No. 7-20-1-2 T. M. No. 5



WRITE FOR FURTHER INFORMATION ON "PERMADINE"
AND YOUR OWN METAL PROTECTION PROBLEMS



- formed into bottle caps and other forms. (L general)
- 246-L. Automatic Spray Painting.** Part III and IV. P. C. Bardin. *Industrial Finishing*, v. 27, May 1951, p. 50-52, 54, 56, 58, 60; June 1951, p. 28-30, 32, 34, 36.
- Part III describes a number of rotary-table types of automatic spraying machines. Part IV discusses electrostatic spray painting. (L26)
- 247-L. Durable Organic Coatings Pinch Hit for Scarce Metals.** B. F. Ames. *Industrial Finishing*, v. 27, June 1951, p. 52, 54.
- Research on various organic coatings as substitutes for strategic metals in the finishing of metallic parts. (L26)
- 248-L. Finishing Movie Film Reels.** Ralph Jones. *Industrial Finishing*, v. 27, June 1951, p. 56-58.
- Cleaning, phosphatizing and rinsing in wire baskets; drying by compressed air; spray painting automatically; and drying in an infrared tunnel of reels made of hard temper, cold rolled steel. (L general, ST)
- 249-L. Finishing the Hotpoint Automatic Washers.** C. P. Nidrabsey. *Industrial Finishing*, v. 27, July 1951, p. 36-38, 40, 42.
- Cleaning of metal parts, phosphatizing their surfaces, rinsing, dry-off, tack-rag wiping, dip coating and spraying prime coat, baking, sanding; then tack-rag wiping again, spraying top coat and final oven baking. (L general)
- 250-L. Putting a High-Class Finish on Aluminum Castings.** Seymour C. Rubenstein. *Industrial Finishing*, July 1951, p. 50-52.
- A method of finishing Al castings. All operations stress light coats of paint and long air drying periods. (L26, Al)
- 251-L. Roller Coating.** P. C. Bardin. *Industrial Finishing*, v. 27, Aug. 1951, p. 12-14, 18, 20, 22, 24, 28, 30, 32.
- Rapid and economical method of applying paint coatings or adhesives to thin flat panels of uniform thickness and to long ribbons of sheet metal, paper or fabric as they unwind from and wind onto large spools or reels. (L26)
- 252-L. Laminated Aluminum Finish Replaces Nickel-Chrome.** W. A. Bartski. *Industrial Finishing*, v. 27, Aug. 1951, p. 44-46, 48.
- Development of a smooth, lustrous, light-silver gray metallic finish that is baked on and will adhere perfectly to metal surfaces and which has good durability. It is suitable for many protective and decorative uses, including replacement for Ni-Cr plating. (L26, Al)
- 253-L. Finishing and Decorating All-Metal Furniture.** Zack Logan. *Industrial Finishing*, v. 27, Aug. 1951, p. 66-68, 70.
- A compact, conveyorized setup includes degreasing and bluing of steel surfaces in burn-off oven, dipping parts in synthetic enamel, baking the coating and spraying decorative lacquer through masks. (L general, ST)
- 254-L. Finishing Industrial Lighting Fixtures.** Gilbert C. Close. *Industrial Finishing*, v. 27, Sept. 1951, p. 28-30, 32, 34, 36, 38, 40.
- Conveyorized setup includes metal parts washing, a phosphate treatment, chromic acid rinse, force drying, spray painting, and oven baking. Facilities for preparation, testing, and controlling of paints and surface treating solutions. (L general)
- 255-L. Finishing Toledo Scale Products.** R. L. McClellan. *Industrial Finishing*, v. 27, Sept. 1951, p. 60-62, 64.
- Finishing operations on parts made of cold rolled sheet steel. Setup includes five-stage metal cleaning and rustproofing, oven dry-off, spraying a prime coat, knife glazing prime-coated castings, sanding, tack ragging and two coats of enamel, each followed by baking in an oven. (L general, ST)
- 256-L. Finish Line for Magnesium Products.** Gilbert C. Close. *Industrial Finishing*, v. 27, Oct. 1951, p. 26-28, 30, 32, 34.
- Special problems that come up when using protective coatings on magnesium die castings and the pretreatment needed to prevent oxidation of the surface. Complete cleaning, drying and painting setup. (L general, Mg)
- 257-L. Finishing X-Ray Apparatus.** J. Lachenman. *Industrial Finishing*, v. 27, Oct. 1951, p. 36, 38, 40.
- Techniques used to clean cast iron, sheet steel, and Al parts in order to receive synthetic bake finishes in off-white and gray-green hammered metallic. (L12, L26, Cl, ST, Al)
- 258-L. Lithographing Metal Cans.** T. A. Griffiths. *Industrial Finishing*, v. 27, Oct. 1951, p. 42, 44, 46, 48, 50.
- Procedures used. (L26)
- 259-L. To Protect Equipment That's Being "Put in Moth Balls".** P. C. Bardin. *Industrial Finishing*, v. 27, Oct. 1951, p. 52, 54, 56, 58.
- Use of rust-preventive oils, strip-pable coatings, and sealed moisture-proof packages. (L26, K10)
- 260-L. Cleaning and Preparing Metal Surfaces for the Application of Modern Paint Coatings.** P. C. Bardin. *Industrial Finishing*, v. 28, Nov. 1951, p. 18-20, 22, 24, 26, 33-34, 36, 38, 40, 42, 44, 46.
- Alkali cleaning and how it is used; acid-solution cleaning, various cleaning solvents, thermal degreasing in burn-off ovens, steam cleaning, and blast cleaning. (L10, L12)
- 261-L. Finishing Space Heater Cabinets.** Walter Rudolph. *Industrial Finishing*, v. 28, Nov. 1951, p. 51-52, 54, 56.
- Procedures used by the Perfection Stove Co., Cleveland. Parts are fabricated from sheet steel. (L general, ST)
- 262-L. Lacquer or Baked Enamel for Pressed Metal Parts.** *Industrial Finishing*, v. 28, Nov. 1951, p. 59-60, 62.
- Discusses the pros and cons for each. (L26)
- 263-L. Finishing Ice Cream Cabinets.** L. B. Kern. *Industrial Finishing*, v. 28, Dec. 1951, p. 34, 36, 38.
- Operations on these cabinets include five-stage pressure spray cleaning and phosphatizing, dryoff oven, prime coat and bake, tack ragging, top coat and bake. (L general)
- 264-L. Finishing Several Different Products in a Small Area.** Howard E. Jackson. *Industrial Finishing*, v. 28, Dec. 1951, p. 62-66.
- Procedures used at the East Side Tool & Die Works, Portland, Ore. Materials of which products are made include steel, Al, brass, and Zn die castings. (L general, ST, Al, Cu, Zn)
- 265-L. Finishing Pease Blueprint Machines.** A. R. Schreiber. *Industrial Finishing*, v. 28, Jan. 1952, p. 24-26, 28.
- After cleaning the metal, a variety of operations follows, depending upon the parts and surfaces being worked on. The finishing of outer surfaces usually includes a coat of surfacer, and knife glazing where necessary, followed by drying, sanding, blowing off, tack-rag wiping, spraying hammer-effect or wrinkle finish, and oven baking at 265° F. (L general)
- 266-L. Production Finishing of Metal Traverse Rods.** Alfred F. LaBee. *Industrial Finishing*, v. 28, Jan. 1952, p. 40-42, 44.
- Vapor degreasing, handling and racking facilities and why electrostatic spray painting is so adaptable to coating these slender pressed-metal products. (L12, L26)
- 267-L. Wet Blast Cleaning Jet Engine Parts.** *Industrial Finishing*, v. 28, Jan. 1952, p. 48-50, 52.
- Procedures used at Pratt & Whitney Aircraft division of United Aircraft Corp. (L10)
- 268-L. Embossed Metal Signs.** W. L. Schubert. *Industrial Finishing*, v. 28, Feb. 1952, p. 18-20, 22, 24.
- Techniques used in applying a protective coating of baked enamel on metal traffic signs, signals, and license plates. Signs are made of 18 and 16-gage U. S. standard regular steel, or zinc-coated, rust resisting sheet steel. (L26, ST)
- 269-L. Descaling of Carbon Steels in Modern Merchant Mill Practice.** C. S. Lambert. *Iron and Steel Engineer*, v. 29, Feb. 1952, p. 59-63; disc., p. 63-65.
- Various types of scale. Removal of scale by high-pressure water. Diagrams. (L12, CN)
- 270-L. Nickel Plating by Chemical Reduction. I. Effect of the Basis Metal.** Robert A. Powers and Norman Hackerman. *Journal of Physical Chemistry*, v. 56, Feb. 1952, p. 187-188.
- Surface configuration of the supporting substance is not of major importance in inducing Ni deposition by chemical reduction either through a similarity to the Ni lattice or through catalytic activity due to surface geometry. Evaporated films of Ni, Fe, Au, Cu, and Pt were prepared by evaporation from a heated tungsten filament and condensation onto glass microscope slides in a chamber evacuated to 5×10^{-6} mm. (L17, Ni, Fe, Au, Cu, Pt)
- 271-L. Hard Surfacing Light Alloy by Anodizing.** *Light Metals*, v. 15, Feb. 1952, p. 46-48. (Based on paper by W. J. Campbell.)
- The "Hardas" process for Al alloys. Production information, uses, and mechanical and physical properties. (L24, L19, Al)
- 272-L. Some Further Observations on the Painting of Aluminum Alloys.** W. A. Edwards. *Light Metals*, v. 15, Feb. 1952, p. 61-63.
- Results of exterior exposure tests with respect to weathering and corrosion. (L26, R3, Al)
- 273-L. Hardfacing With Stellite.** *Machinery* (London), v. 80, Jan. 31, 1952, p. 179-188.
- Methods employed by Deloro Stellite, Ltd., Birmingham, England. Applications. (L24, Co)
- 274-L. Metal Fabrication by Electroforming.** Alan Whittaker. *Machinery* (London), v. 80, Feb. 7, 1952, p. 240-242.
- The various stages involved—master-pattern material selection, surface treatment of master, electrodeposition, and finishing. (L18)
- 275-L. Depositing Stellite by the Electric Arc Process.** *Machinery* (London), v. 80, Feb. 7, 1952, p. 243-244.
- Some applications, including a cast mild steel rotor. (L24, CN, Co)
- 276-L. Recent Developments in Applied Finishes for Aluminum.** A. W. Brace. *Metal Industry*, v. 80, Feb. 1, 1952, p. 91-93.
- Polishing, anodizing, electroplating, paint finishes, and vitreous enamel finishes. 20 ref. (L general, Al)
- 277-L. Barrel Finishing.** *Metal Industry*, v. 80, Feb. 8, 1952, p. 105-107.
- Various types of machines used. (L10)
- 278-L. Pickling and Pickling Acid Inhibitors: Functions, Behaviour and Applications.** Alfred Douty. *Metal Industry*, v. 80, Feb. 8, 1952, p. 108-110.
- Pickling inhibition and control. Mechanism of inhibition. 15 ref. (L12)

279-L. Phosphate Coatings. A. C. Hanson. *Metal Progress*, v. 62, Feb. 1952, p. 81.

A quick test for quality. (L14, R11)

280-L. Enamel Coatings. P. E. Cavanagh. *Metal Progress*, v. 62, Feb. 1952, p. 83-84.

Results of tests on Inconel and 15% Cr, 35% Ni alloy saggers coated with Ferro Enamel Co.'s XS-169G in service at 2200° F. (L27, Ni)

281-L. Polishing Cermets. Clinton C. McBride. *Metal Progress*, v. 62, Feb. 1952, p. 84.

How excellent polished surfaces on TiC, TiN, and mixed carbide-base cermets were obtained using Fe₂O₃ (rouge) as a polishing agent. (L10, C-n, Ti)

282-L. Salt Bath Quenching of High Speed Steel. Walter E. Peterson. *Metal Treating*, v. 3, Jan.-Feb. 1952, p. 5, 11.

Different procedures tried by Gorcham Tool Co., Detroit (L26, TS)

283-L. The Protection of Metallic Surfaces by Chromium Diffusion. Part VII. Applications of Chromising. (Concluded.) R. L. Samuel and N. A. Lockington. *Metal Treatment and Drop Forging*, Feb. 1952, p. 81-85.

Method which can be used to advantage for improving the wear and abrasion resistance of drop forging dies, hand and machine tools, and general purpose tools. Summarizes the present position and future outlook of chromium diffusion and allied processes. (L15, T5, T7, Cr)

284-L. Report on Metal Finishing. *Paint Manufacture*, v. 22, Jan. 1952, p. 14-21; Feb. 1952, p. 51-55, 72.

Report of a visit to the U. S. A. in 1950 of a team representing the British metal finishing industry. Investigation was confined to two main classes of metal-finishing processes: painting and electroplating, including certain related processes such as metal coloring and anodizing. (L17, L19, L26)

285-L. Reproduction of Printed Patterns by Vacuum Evaporation. E. Kafil. *Review of Scientific Instruments*, v. 23, Jan. 1952, p. 54.

A procedure for evaporating Al onto a bonding plastic, "Scotch Weld". The same technique can be applied to any surface which will accept evaporated metals. (L25)

286-L. Smooth Finish for Strip; Moving Abrasive Produces It. S. L. Johnson and R. G. Hall. *Steel*, v. 130, Mar. 3, 1952, p. 82-83.

How coated abrasive paper progressively fed over moving steel strip produces variety of finishes, cleans, and scours the surface evenly on both sides simultaneously. (L10, ST)

287-L. The Lining of Concrete Mixer Drums With Hard Facing. F. Hildred. *Welder*, v. 20, July-Dec. 1951, p. 31-32.

Efficiency and economy achieved by the use of hard facing applied by the electric-arc welding process. (L24, CN)

288-L. Automatic Hardfacing. M. Riddihough. *Welding and Metal Fabrication*, v. 20, Feb. 1952, p. 61-62.

The submerged-arc process for fabrication purposes and for rebuilding and hard facing of such components as steel-mill roll journals and rolls, straightening and table rolls, caterpillar-track rollers and idlers, gyratory crusher cones, etc. 13 ref. (L24, K1, ST)

289-L. Renewing Bearing Surfaces; Electrolytic Iron Saves Critical Parts. R. S. Trent. *Western Machinery and Steel World*, v. 43, Feb. 1952, p. 104-107.

Vanderloy M., an electrolytic iron and Porus-Krome, a glass-smooth, diamond-hard plating that retains oil. Processes involved. Micrographs. (L17, SG-c, Fe, Cr)

290-L. South American Wire Galvanizing Plant. *Wire Industry*, v. 19, Feb. 1952, p. 135-138.

Production at an unidentified plant; surveys the situation and makes suggestions for improving technique. (L16, CN, Zn)

291-L. Plating High-Tensile Steels; Some Notes on Methods of Pretreatment and Electrodeposition. H. Cann and H. F. Henley. *Aircraft Production*, v. 14, Mar. 1952, p. 87-89.

Mechanical and chemical methods of scale removal, techniques on selective plating, and heat treatment after plating. (L17, J general, ST)

292-L. Ceramic Coatings. *Aircraft Production*, v. 14, Mar. 1952, p. 107-108.

A ceramic coating "A-417" developed by U. S. National Bureau of Standards in the U. S. is composed of a high-barium, alkali-free frit (glass) with a 30% admixture of chromic oxide. Applications. Data are tabulated. (L27)

293-L. Spray and Sinter to Make High Temperature Alloy Parts. James E. Cline, Robert T. Thurston, and John Wulff. *American Machinist*, v. 96, Mar. 3, 1952, p. 172-175.

Technique by which thin-walled bodies of rotational symmetry impossible to produce by other means can be produced by metal spraying, followed by sintering in a reducing atmosphere. (L23, H15, SG-h)

294-L. The Preparation of Metallic Surfaces for the Application of Coatings. S. M. Anderson. *Australasian Engineer*, Jan. 7, 1952, p. 68-70.

(L general)

295-L. On the Mechanism of Electrolytic Polishing of Metals. W. J. McG. Tegart and R. G. Vines. *Australasian Engineer*, Jan. 7, 1952, p. 70-72.

Various theories. Proposes a single unifying hypothesis. (L13)

296-L. Electrolytic Polishing; a Process for Treating Stainless Steels and Irons. *Automobile Engineer*, v. 42, Feb. 1952, p. 56.

In the Electropol process, the work is the anode. When current is passed, metal is removed from the outer surface of the work. Applications. (L13, SS, Fe)

297-L. How to Save Nickel in an Enamel Plant by Lengthening Bath Life. *Ceramic Industry*, v. 58, Mar. 1952, p. 61.

Converting colloidal iron created in the nickel dip to particles of suitable size for filtering prolongs bath life. Claims that this process will save thousands of dollars annually in many enameling plants. (L27, Ni)

298-L. Refinery Painting. W. B. Cook. *Corrosion (Technical Section)*, v. 8, Mar. 1952, p. 93-99.

Selection of surface-preparation methods and paint coating systems to provide the best economic results for protection, decorative effect, and other benefits to be derived from the application of paints and coatings to surfaces exposed to specific refinery conditions. (L26)

299-L. Production Enameling on Small Items. Walter Rudolph. *Finish*, v. 9, Mar. 1952, p. 37-39.

How Erie Ceramic Arts Co., Erie, Pa., coats small metal and glass parts. (L27)

300-L. Painting Castings Electrostatically. *Foundry*, v. 80, Mar. 1952, p. 240, 242.

Principle and method as applied at Textile Machine Works, Foundry Div., Wyomissing, Pa. (L26)

301-L. Application of Dilatometric Analysis to the Problem of Enamelling Cast Iron. Auguste Le Thomas and Pierre Tyvaert. *Foundry Trade Journal*, v. 92, Feb. 7, 1952, p. 151-155.

In borderline cases, selection of enamels with suitable expansion ranges, as revealed by the tests described, may make the difference between success and failure of the coating. (L27, CI)

302-L. Savings by the Barrel. Charles O. Furbish. *General Electric Review*, v. 55, Mar. 1952, p. 40-43.

The tumbling process for deburring, smoothing, shaping and other surface finishing operations. (L10)

303-L. Ultrasonic Cleaning of Small Parts. George E. Henry. *General Electric Review*, v. 55, Mar. 1952, p. 60-61.

A method of removing oil, grease, chips, dirt, lapping compounds, and many other contaminants from the surfaces of small precision workpieces at a rate hitherto unattainable, and to a degree of cleanliness that usually surpasses the most stringent industrial standards. (L10)

304-L. On the Role of Nickel in Porcelain Enameling. J. H. Keeler, P. K. Chu, and H. M. Davis. *Journal of American Ceramic Society*, v. 35, Mar. 1, 1952, p. 72-75.

Nickel applied to sheet steel as a Ni flash endures in the surface through several de-enameling and re-enameling. The attendant improvement in the enameling behavior of the steel is similarly persistent. Heat treating experiments with and without Ni lead to the conclusion that, while the fired assembly is cooling, nickel oxide at the interface is reduced by H₂ from the steel, forming water which enters the enamel and diminishes the hydrogen available for defect production. 17 ref. (L27, ST, Ni)

305-L. Phosphate Coating vs. Galvanizing. John H. Lawrence. *Machinery Lloyd (Overseas Ed.)* v. 24, Feb. 16, 1952, p. 105-106.

Comparative values obtained by salt-spray and actual weathering tests. Impact and distortion tests were also made. Graph presents corrosion resistance data. (L14, L16, R3, Q6, ST, Zn)

306-L. Plating Hints; Correct Maintenance of Electrical Installations. T. M. Rodgers. *Metal Industry*, v. 80, Feb. 22, 1952, p. 147-148.

(L17)

307-L. The Coating of Steel With Aluminium. D. P. Moses, and G. G. Popham. *Metallurgia*, v. 45, Feb. 1952, p. 70-74, 84.

Reviews principal methods for application of Al coatings to steel. Micrographs. 32 ref. (L general, Al, ST)

308-L. Relative Importance of Various Sources of Defect-Producing Hydrogen Introduced Into Steel During Application of Vitreous Coatings. Dwight G. Moore, Mary A. Mason, and William N. Harrison. *National Advisory Committee for Aeronautics, Technical Note 2617*, Feb. 1952, 31 pages.

Previously abstracted from *Journal of the American Ceramic Society*. See item 168-L, 1952. (L27, ST)

309-L. Solid Films on Electropolishing Anodes. T. P. Hoar and T. W. Farthing. *Nature*, v. 169, Feb. 23, 1952, p. 324-325.

Evidence of the presence of a solid film (dissolving at its outer service as fast as it is formed anodically from the metal) during the electropolishing of Cu and α -brass anodes in a 50/50 by volume orthophosphoric acid/water bath. (L13, Cu)

310-L. A Survey of Special Purpose Coatings. Edward Engel. *Organic Finishing*, v. 13, Feb. 1952, p. 11-13, 16.

Wrinkle finishes, polychrome metallic finishes, flock, luminous paints, decals or transfers, and stencil finishing. Behavior on metal surfaces. (L26)

311-L. Metallizing for Decorative Purposes. Ernest Mueller. *Organic Finishing*, v. 13, Feb. 1952, p. 17-18.

A double barreled spray gun for simultaneously spraying Ag and reducer solutions. (L23, Ag)

312-L. Some Characteristics of Zinc Cyanide Plating Solutions. H. Haring

Cell Throwing Power. Gustaf Soderberg. *Plating*, v. 39, Mar. 1952, p. 255-256, 260.

Results of an investigation. (L17)

313-L. Barrel Finishing. II. Selection of Equipment. Morris S. Shipley. *Plating*, v. 39, Mar. 1952, p. 257-260.

Points to consider in equipping a barrel-finishing department for efficient operation. (L10)

314-L. Tentative Recommended Practice for Preparation of and Plating on Aluminum Alloys. *Plating*, v. 39, Mar. 1952, p. 265-266.

(To be continued.) (L17, A1)

315-L. The Hot-Dip Galvanizing of Structural Steel Sections. R. A. Painter. *Proceedings of Institution of Electrical Engineers*, v. 99, pt. 2, Feb. 1952, p. 39-46.

Brief description of the metallurgical structure of a Zn coating, together with some information on its expected life. A condensed description of the process, and of certain methods of quality control. Advice on maintenance of the finished product. (L16, M27, CN, Zn)

316-L. Phosphate Coatings for Military Products. Norman P. Gentieu. *Product Engineering*, v. 23, Feb. 1952, p. 183-190.

A review of the types of phosphate coatings being specified by the armed services for protection of metal surfaces. Tabulated list of specifications. (To be continued.) (L14)

317-L. Tool Joints Hard-Faced. Fred M. Burt. *Welding Engineer*, v. 37, Mar. 1952, p. 28-29.

The advantages of hard facing with tungsten carbide. (L24, W, C-n, Ts)

318-L. Metallizing a Viaduct. W. C. Henzlik. *Welding Engineer*, v. 37, Mar. 1952, p. 40-42.

Process whereby sprayed Al is given an overcoating of a special Al vinyl plastic to provide 20-50 years of protection for newly built steel bridges and viaducts. (L23, L26, T26, Al, CN)

319-L. Absolute Determination of the Condensation Factors of Molecular Jets of Antimony on a Surface. (In French.) Marcel Devienne. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 2, 1952, p. 80-81.

Determined on the basis of the relation between the value of the radioactivity of a thin layer of Cu on a condensation plate and the sum of the radioactivity of this deposit and condensations on the lateral surface of a metallic cylinder and on a reflection plate. Includes diagram. (L25, Sb)

320-L. Intervention of Specificity in the Formation of Metallic Deposits on Glass. (In French.) Jean Loiseleur. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 2, 1952, p. 162-164.

Formation of a metallic deposit on glass was found to require previous preparation of the surface, consisting in formation of a nonmolecular layer by treatment with a very dilute solution of the metal to be deposited. The presence of this layer is said to impose a specificity comparable to the adaptation of an antibody to its antigen. That is, a deposit of a particular metal cannot usually be formed if the surface treatment was with a solution of a different metal. Results for Cu, Au, and Rb are tabulated. (L general, Cu, Au, Rb)

321-L. Notes Concerning Welding-on of Gear Teeth. (In Czech.) Josef Nemec. *Hutnické Listy*, v. 6, Dec. 1951, p. 586-589.

Problems connected with the use of welded (built-up) gear teeth in coal-mining equipment. Materials deposited. (L24, ST)

322-L. Some Remarks on the Subject of Zinc Replacement. (In French.) A. Gordet. *Métallurgie et la Construction Mécanique*, v. 83, Dec. 1951, p. 1011, 1013-1015.

Replenishment of the Zn content of galvanizing baths with secondary Zn. Results of a survey of factors affecting the galvanizing process and quality of the products. (L16, Zn, CN)

323-L. Determination of the Electrical Characteristics of the Anodic Oxide Film on Aluminum. (In Italian.) W. Ruff. *Alluminio*, v. 20, Dec. 1951, p. 540-552.

Circuit diagrams of an apparatus developed to determine the current present just before perforation of the film. It was found that electrical behavior is not improved by increased oxidation time; that advantages of sealing with Ni and Co acetate appear only after 1 month, and require an oxidation time of at least 25 min.; and that the sealing effect varies with composition of the Al and is better in 95% Al soft sheets than in hardened ones. Data are charted and tabulated. 11 ref. (L19, P15, A1)

324-L. Repairing Cast Iron Cylinders for Rolling Mills by Means of Cast Material. (In Italian.) R. Rolla and A. Colle. *Mettallurgia Italiana*, v. 44, Jan. 1952, p. 6-8.

The repair was carried out by washing the surface to be welded with molten cast iron, then machining to necessary dimensions. Application to repair of 17-30-in. diam. cylinders weighing 2-4 tons. Includes weld photomicrographs. (L24, CI)

325-L. Rust Protection (in Industrial Coating Practice). (In German.) Otto Gerhardt. *Werkstoffe und Korrosion*, v. 2, Dec. 1951, p. 444-446.

Need for renewing the paint on weather-exposed iron and steel structures in Germany. Various passivating undercoatings and topcoats, properties of suitable pigment binders, and the most recent development in silicone and fluorohydrocarbon coatings. (L26, Fe, ST)

326-L. Protection of Iron by Painting. (In German.) Manfred Ragg. *Werkstoffe und Korrosion*, v. 3, Jan. 1952, p. 11-17.

Properties and qualities of different paints and paint ingredients as protective coatings. Data are tabulated. (L26, Fe)

METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES

111-M. Preferred Grain Orientation in Steel Castings. J. D. Lavender and J. I. Morley. *Journal of the Iron and Steel Institute*, v. 170, Jan. 1952, p. 26-28.

Considered in relation to the allotropic transformations that occur during cooling. Where these transformations occur at very high temperatures, of the order of 1300° C., as in certain stainless steels, the crystallographic orientation of the primary dendrites is preserved at room temperature, and columnar-grained castings will then be subject to elastic anisotropy. Where they occur at 700° C. and below, as in mild steel, a random orientation is developed during recrystallization, and a test on a columnar-grained specimen of mild steel suggests that such castings will be elastically isotropic. (M27, N12, ST)

112-M. A Microscopical Examination of Iron Containing Manganese Inclusions. R. E. Lismer and F. B. Picker-

ing. *Journal of the Iron and Steel Institute*, v. 170, Jan. 1952, p. 48-50.

Samples of three ingots containing inclusions of varied MnO content were examined under normal vertical illumination, under polarized light, after application of Whiteley's tests, and after acid tests. Optical and chemical characteristics of the inclusions were determined. (M27, Fe)

113-M. Ferrite-Grain-Size Measurements for Ship Plate Steel. J. E. Campbell, R. H. Frazier, and H. O. McIntire. *Welding Journal*, v. 31, Feb. 1952, p. 78s-90s; disc. 90s-94s.

Ferrite grain sizes were determined in Class A ship plate in the as-rolled condition and after austenitizing at various temperatures followed by cooling at various rates. Results obtained using intercept methods, grain counting, comparison with a special series of photomicrographs, and a fracture method for rating ferrite grain sizes were compared. Micrographs. 10 ref. (M27, CN)

114-M. Influence of Carbon on the Lattice Parameter of Molybdenum. Rudolph Speiser, J. W. Spretnak, W. E. Few, and R. M. Parke. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 275-277.

Investigation was undertaken because of the known fact that interstitial carbon may cause intergranular brittleness in Mo. Various heat treatments, C analyses, and X-ray measurements were conducted. Results show that C dissolves interstitially in Mo resulting in linear expansion of lattice parameter with increase of C in solid solution. Geometrical consideration of the relationship of C-atom size to size of interstice approximately predicts the observed volume expansion. 12 ref. (M26, Q23, Mo)

115-M. Zirconium-Chromium Phase Diagram. E. T. Hayes, A. H. Robertson, and M. H. Davies. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 304-306.

Details of a cooperative project between the Bureau of Mines and Air Material Command. The Zr-Cr system was investigated in the range 0-53% Cr to determine possibilities of improving corrosion resistance and mechanical properties of Zr in a manner similar to the enhancement of the properties of Ti by additions of Cr. Phase diagrams and photomicrographs. (M24, Zr, Cr)

116-M. Crystal Chemical Studies of the 5f-Series of Elements. XV. The Crystal Structure of Plutonium Sesquicarbide. XVI. Identification and Crystal Structure of Protactinium Metal and of Protactinium Monoxide. (In English.) W. H. Zachariasen. *Acta Crystallographica*, v. 5, Jan. 1952, p. 17-21.

Interpretation of diffraction data. (M26, C-n, Pa, Pl)

117-M. The Structure of an α/β Brass. (In English.) R. J. Davis, R. Pearce and W. Hume-Rothery. *Acta Crystallographica*, v. 5, Jan. 1952, p. 36-38.

A detailed examination of the structure of an α/β brass. In the annealed state, ordinary etching methods reveal small angular crystals of the α phase embedded in large crystals of β . Careful electrolytic polishing and etching show that the large β crystals are in reality colonies of much smaller grains. The effect of annealing on the form of the α and β crystals, and reasons for the formation of the β substructure. Micrographs. (M26, Cu)

118-M. The Structure of Alloys of Lead and Thallium. (In English.) You-

Chi Tang and Linus Pauling. *Acta Crystallographica*, v. 5, Jan. 1952, p. 39-44.

Alloys of Pb and Tl have a structure based upon cubic closest packing from 0 to about 87.5 at. % Tl. Variation of the lattice constant with composition gives strong indication that ordered structures PbTl and PbTl₂ exist. A theory of the structure of the alloys is presented. 12 ref. (M26, Pb, Tl)

119-M. The Structure of TiBe₂. (In English.) R. F. Rauechle and R. E. Rundle. *Acta Crystallographica*, v. 5, Jan. 1952, p. 85-93.

Results of an investigation. The structure seems to involve a not quite fully ordered superlattice, and it seems possible that the nature of the disorder may yet become understandable. (M26, NiO, Be, Ti)

120-M. Using Chlorinated Rubber as a Film Support for Samples in Electron Microscopy. (In French.) Francois Davoine and Emile Pernoux. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Dec. 19, 1951, p. 1590-1591.

Two techniques and the satisfactory results obtained. (M21)

121-M. Chemical Polishing of Iron and Soft Steel. (In French.) Louis Beaujard. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 21, 1952, p. 440-442.

A solution suitable for chemical polishing of soft steels containing less than 0.05% C. It consists of 30 parts HNO₃, 70 parts HF, and 300 parts water. Temperature recommended is 60° C. Includes photomicrograph and diagram. (M21, Fe, ST)

122-M. The Structure of AlAu. (In Russian.) V. G. Kuznetsov and V. I. Rabezova. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 1, 1951, p. 51-54.

X-ray and microscopic studies were made of Au-Al alloys containing 96.75 and 96.65 wt. % Au. Data are tabulated and charted. (M26, Al, Au)

123-M. Structure of Sputtered Silver Films. C. E. Ellis and G. D. Scott. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 31-34.

Films were studied with the electron microscope, and their structure and physical properties correlated with data available for evaporated films. A possible explanation for the results is proposed. 18 ref. (M27, L25, P general, Ag)

124-M. Electron Diffraction Evidence for the Existence of Microstress in Evaporated Metal Films. Eber K. Halteman. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 150-151.

Line broadening in electron-diffraction powder patterns from evaporated Ni films was investigated. The pure diffraction broadening was found to vary with Bragg angle in agreement with a microstress theory of broadening rather than with a particle-size mechanism. The Fourier transform of pure diffraction broadening was determined and also found to be in agreement with a microstress mechanism. (M22, L25, Q25, Ni)

125-M. Direct Printing of Shadowed Electron Micrographs. R. M. Fisher. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 153-154.

Technique which has been applied in metallography of steel. (M21)

126-M. The X-Ray Diffraction Study of Single Crystals of Lead. Y. C. Chuang. *Metallurgia*, v. 45, Feb. 1952, p. 99-101.

A method by which lead single crystals can be produced. The orientation of the crystal was determined by the back-reflection Laue method. (M26, Pb)

127-M. Survey of the Chromium-Cobalt-Nickel Phase Diagram at 1200° C. W. D. Manly and Paul A. Beck. *National Advisory Committee for Aeronautics*, Technical Note 2602, Feb. 1952, 45 pages.

Microscopic and X-ray diffraction studies on 110 vacuum-melted alloys prepared from commercial metals of the highest purity available. Tables, graphs, and micrographs. (M24, Cr, Co, Ni)

128-M. Survey of Portions of the Cobalt-Chromium-Iron-Nickel Quaternary System. E. L. Kamen and Paul A. Beck. *National Advisory Committee for Aeronautics*, Technical Note 2603, Feb. 1952, 62 pages.

An isothermal survey. The Fe content was varied up to 30% to include the range of commercial Cr-Co-Ni alloys. Tables, graphs, and micrographs. 14 ref. (M24, Co, Cr, Fe, Ni)

129-M. Solubility of Magnesium in Lithium. J. A. Catterall. *Nature*, v. 169, Feb. 23, 1952, p. 336.

The phase diagram of Mg in Li has been well established except for the solid solubility of Mg in Li. Presents a diagram establishing this boundary by microscopical examination of alloys annealed and quenched at various temperatures. (M24, Mg, Li)

130-M. Ferrite Determination in Austenitic Stainless Steel. (In Dutch.) K. K. Zwart. *Smit Mededelingen*, v. 6, Oct.-Dec. 1951, p. 119-121.

The magnetic properties of an austenitic stainless steel depend on the amount of ferrite in it. Thus, the percentage of ferrite in such a steel can be ascertained by magnetic measurements. An apparatus for performing such measurements, consisting of a balance and an a.c. excited magnet. (M23, P16, SS)

131-M. Nitriding of Columbium. (In French.) Albert Septier, Maurice Gauzit, and Pierre Baruch. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 2, 1952, p. 105-107.

A columbium nitride wire was studied under the electron microscope, and probable existence of a subnitride discussed. The new method of observation increases the possibilities of using the emission microscope in metallography. Method of preparation of the wire. Micrographs. (M27, Cb)

132-M. Heat-Resistant Cast Steel. (In German.) H. Lüling. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 18, Jan. 1952, p. 22-32.

Results of experiments on effect of carbon, various alloying elements, and heat treatment on structure and mechanical properties. Macrographs, micrographs, photographs, tables, and graphs. 22 ref. (M27, Q general, Cl, SG-b)

133-M. Remarks on the Existence of Molybdenum Carbide. (In German.) H. Nowotny and R. Kieffer. *Zeitschrift für anorganische und allgemeine Chemie*, v. 267, Jan. 1952, p. 261-264.

Investigation of C-rich Mo carbides reveals, not the cubic phase-centered Mo₃C, but a phase that corresponds more to MoC with slight carbon deficiency. 11 ref. (M26, Mo, C-n)

134-M. Research on Cobalt-Beryllium Alloys. (In Italian.) G. Venturello and A. Burdese. *Alluminio*, v. 20, Dec. 1951, p. 558-564.

The Co-Be system was studied by X-ray, micrographic, and thermal-analysis methods. Two intermetallic compounds were found: Co-Be and Co₂Be₃, both cubic. Effects of heat treatment on alloys containing 1.56, 1.87, and 2.10% Be. Data are tabulated and charted. Micrographs and radiation patterns. 10 ref. (M24, Co, Be)

135-M. Submicroscopic Structure of "Magnico" Alloy. (In Russian.) N. N. Buinov and V. V. Kliushin. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 11, 1951, p. 739-742.

An alloy containing 50% Fe, 24% Co, 14% Ni, 9% Al, and 3% Cu was investigated. Replicas for electron microscopy were made by an oxidation method and by a single-step quartz method. Includes micrographs at 7000, 21,000, and 51,000. (M27, M21, Fe, SG-n)

136-M. A Method of Representing Quintuple and More Complex Metallic Systems. (In Russian.) I. I. Kornilov. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 11, 1951, p. 191-194.

A system for the graphical representation of equilibria in specific regions of complex metallic systems was developed. Examples are illustrated and explained. (M24)

137-M. New Intermetallic Compounds in the Fe-Mo Binary System. (In Russian.) R. P. Zaitaeva, N. F. Lashko, M. D. Nesterova, and S. A. Iuganova. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 21, 1951, p. 415-416.

A new compound was found in a molybdenum steel (0.1% C, 16% Cr, 25% Ni, 6% Mo). X-rays showed this compound to be Fe₃Mo. Its structure was the same as previously observed for Fe₃W. Data are tabulated. (M24, M26, Fe, Mo)

138-M. Solid Solutions of Metallic Compounds. (In Russian.) I. I. Kornilov. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 1, 1951, p. 597-600.

Types of intermetallic compounds and conditions of forming solid solutions among these compounds. Numerous examples. 13 ref. (M26)

139-M. The Ni-Si Constitution Diagram. (In Russian.) N. F. Lashko. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 1, 1951, p. 605-607.

Microstructure and lattice dimensions of Ni-Si alloys containing 2, 4, and 7% Si were studied. Results are tabulated and illustrated. (M24, Ni)

TRANSFORMATIONS AND RESULTING STRUCTURES

71-N. Effect of Alloying Elements on the Breakdown of Austenite at Sub-Zero Temperatures. Part I. J. O. Ward, M. D. Jepson and J. R. Rait. *Journal of the Iron and Steel Institute*, v. 170, Jan. 1952, p. 1-9.

In the preliminary experiments, using a 1% C, 0.3% Mn steel material, up to 3-4% of Mn, Cr, and Ni were added separately. The amount of subzero transformation was increased by Mn and Ni; but, although increasing at first upon addition of Cr, it fell off at more than 1% Cr. 16 ref. (N8, AY)

72-N. Diffusion in Indium Near the Melting Point. Roger E. Eckert and H. G. Drickamer. *Journal of Chemical Physics*, v. 20, Jan. 1952, p. 13-17.

Diffusion coefficients for the systems Ti¹¹¹ in In and In¹¹¹ in In were measured in the solid state and in the neighborhood of the melting point. The measurements were made in both polycrystalline masses and in single crystals. (N1, In)

73-N. Distribution of Hydrogen in Large Ingots and Forgings. J. D. Hobson and C. Sykes. *Journal of the Iron and Steel Institute*, v. 170, Feb. 1952, p. 118-122.

Severe segregation occurs and persists in finished forgings. The variation found depends upon the

size of sample, being much more severe with small specimens. Rehydrogenation experiments demonstrate that segregation is not caused by variable hydrogen solubility. Some practical implications of the results. Data are tabulated. (N12, D9, ST)

74-N. Isothermal Martensite Formation in an Iron-Chromium-Nickel Alloy. S. A. Kulin and G. R. Speich. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 258-263.

The isothermal formation of martensite at subzero temperatures was studied in an austenitic stainless steel. Amount of martensite formed isothermally in a given time was found to follow a C-curve behavior with decreasing temperature. It is believed that a general martensite theory must include the basic concepts of the strain embryo theory, and also the important role of thermal fluctuations. 12 ref. (N8, SS)

75-N. Origin of Recrystallization Textures. J. E. Burke. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 263-264.

Discusses various theories. 10 ref. (N5)

76-N. Time-Temperature-Transformation Characteristics of Titanium-Molybdenum Alloys. D. J. DeLazaro, M. Hansen, R. E. Riley, and W. Roskoff. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 265-269.

Summarizes, on conventional TTT-charts, the isothermal transformation products and pertinent reaction-rate data for binary alloys of Ti containing 1, 3, 5, 7, 9, and 11% Mo, respectively. The results were derived from metallographic examination. X-ray diffraction work was done to clarify certain points. (N9, M24, Mo)

77-N. Solubility of Carbon and Oxygen in Molybdenum. W. E. Few and G. K. Manning. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 271-274.

It has been known for some time that both intergranular carbide and intergranular oxide phases cause brittleness in Mo. Hence experiments were made on their solubility at temperatures up to 4000° F., following heat treatments in various atmospheres. Results are tabulated, charted, and illustrated by photomicrographs. (N12, M24, Mo)

78-N. Relation Between the Volume of Martensite and the Number of Martensitic Plates Per Unit Volume. E. S. Machlin. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 271-278.

Presents mathematical analysis of above problem conducted in an effort to solve the problem of the rate of nucleation during martensitic transformations. (N2, N8)

79-N. On the Mechanism of Precipitation in Copper-Beryllium Alloys. A. H. Geisler, J. H. Mallory, and F. E. Steigert. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 307-316.

Reconciles existing data with some new data to present a more complete and rational analysis of the atomic re-arrangements involved in the process. Two different coherent precipitates were proposed. Each is responsible for a type of diffuse X-ray diffraction effect. 29 ref. (N7, Cu)

80-N. Dendritic Growth in Weld Metal. M. A. Scheil. *Metal Progress*, v. 62, Feb. 1952, p. 80-81.

Two macrographs, one of a weld made in five passes in Type 316 stainless steel plate; and the other of a 14-pass weld in 1½-in. stainless plate. In the first, demarcation between the layers is well defined. In the second, dendritic growth is practically continuous. (N12, K1, SS)

81-N. Isothermal Transformation of Nickel Steels. *Metal Progress*, v. 62, Feb. 1952, p. 102, 104-106, 108. (Condensed.)

Previously abstracted from *Metalurgia*. See items 148-N and 185-N, 1951. (N8, AY, SS)

82-N. The Recrystallization of Martensite. *Metal Progress*, v. 62, Feb. 1952, p. 158, 160. (Translated and condensed from "Recrystallization of Austenite Caused by Internal Stresses". K. A. Malyshev, V. D. Sadovskii, and B. G. Sazonov.)

Previously abstracted from *Doklady Akademii Nauk SSSR*. See item 71-N, 1951. (N5, N8, ST)

83-N. Aging Phenomena in Iron and Steel After Rapid Cooling. J. D. Fast. *Philips Technical Review*, v. 13, Dec. 1951, p. 165-171.

Internal structure of iron and iron alloys; solubility of Mn, C, N₂, and O₂ in α -iron; nucleation; diffusion; precipitation; and quench aging as determined by hardness measurements. (N7, Fe, ST)

84-N. The Effect of Neutron Irradiation on Metallic Diffusion. T. H. Blewitt and R. R. Colman. *Physical Review*, ser. 2, v. 85, Jan. 15, 1952, p. 384.

Diffusion in Cu-Au samples. (N1, Au, Cu)

85-N. The Effect of Mercury on Selenium. H. K. Henisch and E. Q. Saker. *Proceedings of the Physical Society*, v. 65, sec. B, Feb. 1, 1952, p. 149-154.

The extent to which mercury can penetrate into Se specimens was investigated. Results show that there is penetration to considerable depths which may be due to diffusion through the lattice or along grain boundaries. The principal electrical effects are shown to be due to the formation of mercuric selenide at the surface. There is also evidence, from experiments with radioactive mercury, of rapid surface diffusion. (N1, P15, Hg, Se)

86-N. Thermodynamic Interpretation of Aging Phenomena in Alloys. (In Russian.) L. S. Palatnik. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 1, 1951, p. 39-42.

The aging of alloys is explained from a thermodynamic standpoint. Results are discussed in relation to experimental data. Data are charted. (N7, P12)

87-N. The Nature of Molten Iron Silicate and Solutions of FeS in It. (In Russian.) Ia. I. Ol'shanskii. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 1, 1951, p. 67-70.

The solubility of FeS in various mixtures of FeO, SiO₂, CaO, and MgO was studied experimentally. Data are charted. (N12, Fe)

88-N. Study of the Homogenization of Dendritic Segregates of Phosphorous and Arsenic in Alloy Steels. (In French.) André Kohn. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Dec. 19, 1951, p. 1617-1619.

Diffusion of phosphorous in steels occurs more rapidly than that of arsenic. It does not appear to be influenced very much by the presence of alloying elements generally encountered. Micrographs. (N1, M27, AY)

89-N. Magnetic Study of Martensitic Transformations Produced by Working or by Heating of Steels Con-

taining 18% Chromium and 4 to 12% Nickel. (In French.) Paul Bastien and Jacques Dedieu. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 14, 1952, p. 334-336.

(N8, SS)

90-N. X-Ray Measurement of Order in CuPt. C. B. Walker. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 118-123.

In investigating the order-disorder transformations in CuPt, cell parameters were determined from specimens quenched at intervals from 25 to 890° C. The rhombohedral deformation of the ordered, layered structure was found to diminish with increasing temperature, disappearing at a critical temperature of 815° C. Cold working an ordered sample was found to transform the alloy almost completely from the ordered rhombohedral cell to the disordered cubic cell. (N10, Pt, Cu)

91-N. Investigation of the Solidification of Steel. I. Theoretical Principles. (In Czech.) Nikolaž Chvorinov. *Hutnické Listy*, v. 6, Nov. 1951, p. 549-552; Dec. 1951, p. 594-598.

The solidification of steel is considered from a theoretical point of view. A series of factors are not included because of the lack of experimental data. A complicated method is suggested for further study of the problem. (N12, ST)

92-N. Recrystallization of Thin Layers of Copper; Experimental Results. (In French.) Antoine Colombani and Gaston Ranc. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 2, 1952, p. 78-80.

Thin layers of Cu were deposited by thermal evaporation on plexiglas and NaCl supports. Thickness and structure of the deposits were studied. Diagrams and graphs. (N5, L25, Cu)

93-N. Growth Spirals on Gold Crystals Obtained by Precipitation. (In French.) Séverin Amelinckx, Carl C. Grosjean, and Willy Dekeyser. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 2, 1952, p. 113-115.

Studied with respect to the theory of Frank which states that crystal growth occurs, in the case where supersaturation is small, by the joining of growth units along the exposed edge created by the formation of one or several helicoidal dislocations on one of the sides of the primary nucleus. Photograph and diagram. (N12, Au)

94-N. X-ray Study of the Aging of an Aluminum-Magnesium Alloy Containing 7% Magnesium. (In French.) Adrienne R. Weill. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 28, 1952, p. 523-525; disc., p. 525-526.

When tempering at 160 or 250° C. of above alloy is accompanied by the formation of Mg-rich precipitates, after 6 months at 55° C., one can detect by X-rays a strongly stressed state of the lattice, which was not noticeable at higher temperatures before the appearance of precipitates. Includes micrographs and discussion by Pierre Chevenard. (N7, Al)

95-N. Study of the Phenomena of Recrystallization by Electron Microscopy. (In French.) G. W. Rathenau. *Revue de Métallurgie*, Dec. 1951, p. 923-928; disc., p. 928.

Phenomena of recrystallization and grain growth in cold rolled, face-centered NiFe crystals were investigated. (N3, N5, Ni, Fe)

96-N. Spectrographic Study of the Diffusion of Copper and of Magnesium in Electrodeposited Al-Cu-Mg and Al-Zn-Mg-Cu Alloys. (In French.) Martial Renouard. *Revue de Métallurgie*, Dec. 1951, p. 944-955, disc., p. 955-956.

Theoretical, mathematical analysis. Experimental procedures, results, and their interpretation. The alloys studied are Al-base. Data are charted and tabulated. (N1, L17, A1)

97-N. A Method of Studying Changes of Phase at High Temperatures by Means of X-Rays. (In French.) H. T. Heal and H. Mykura. *Revue de Métallurgie*, Dec. 1951, p. 966-969.

A method in which a Geiger-Müller counter is used to measure the total intensity of a diffraction line emanating from any phase; and in which the counting cadence, registered electronically, indicates the proportion present of the phase in question. Application to transformations of a low-alloy steel. Graphs and diagram. (N6, AY)

98-N. Thermoelectric Study of the Recrystallization of Cu-Zn Alloys. (In French.) P. Laurant and M. Eudier. *Revue de Métallurgie*, Dec. 1951, p. 970-974.

Cold worked wires were placed in an oven at a constant temperature and taken out at various times; couples were formed with the annealed wires and their thermoelectric power at low temperature measured. Compositions studied varied from pure Cu (99.7%) to 70-30 Cu-Zn. Data are charted. 16 ref. (N5, Cu)

99-N. The Question of the Intermediate Transformation of Austenite. (In Russian.) R. I. Entin. *Doklady Akademii Nauk SSSR*, new ser., v. 79, Aug. 21, 1951, p. 973-976.

Mechanism of the decomposition of austenite in the range 450-600° C. The influence of C, Ni, Cr, W, Mo, and Mn on variation of the mechanism. (N8, AY, ST)

100-N. The Influence of Carbon on the Self-Diffusion of Iron. (In Russian.) P. L. Gruzin, Iu. V. Kornev, and G. V. Kurdumov. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Sept. 1, 1951, p. 49-51.

Radioactive Fe⁵⁹ was used to study the self-diffusion of Fe in various steels. Data are tabulated and charted. (N1, Fe, ST)

101-N. Capillary Phenomena During Contact Melting of Crystals. (In Russian.) D. D. Saratovkin and P. A. Savintsev. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 1, 1951, p. 631-633.

The phenomenon of contact melting of Sn-Zn, Bi-Sn, Pb-Pb, and Pb-Sb metal pairs was studied experimentally. In each case a globule of one metal was melted by contact with a hot plate or sheet of the other. (N12, P12, Sn, Zn, Bi, Pb, Sb)

102-N. Certain Regularities of Diffusion and Mechanical Properties of Metals. (In Russian.) I. Ia. Dekhtiar. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 21, 1951, p. 875-878.

The theory of rate processes is applied to self-diffusion and creep strength of Cu, Al, steel, Pb, and Sn. Data are tabulated and charted. (N1, Q3, Cu, Al, St, Pb, Sn)

103-N. "Diffusion" Supercooling During Crystallization of Binary Alloys. (In Russian.) G. P. Ivantsov. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 11, 1951, p. 179-182.

By theoretical considerations it is shown that a layer of supercooled liquid is formed at the crystallization front even if equilibrium conditions are maintained. Results are charted. (N12)

104-N. The Question of the Influence of Deformation on the Kinetics of the Martensite Transformation. (In Russian.) O. P. Maksimova and A. I. Nikonov. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 11, 1951, p. 183-186.

The effect of temperature and amount of deformation on the martensite transformation was studied for various Ni and Mn steels. Data are charted. (N8, AY)

105-N. Kinetics of the Martensite Transformation at Temperatures Above Room Temperature. (In Russian.) G. V. Kurdumov and O. P. Maksimova. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 1, 1951, p. 565-568.

The martensite transformation in a steel containing 0.8% C and 2.2% Mn was studied at temperatures from -196 to +155° C. Data are charted. (N8, AY)

PHYSICAL PROPERTIES AND TEST METHODS

120-P. The Influence of the Core Material on the Thermionic Emission of Oxide Cathodes. H. A. Poehler. *Proceedings of the I.R.E.*, v. 40, Feb. 1952, p. 190-196.

Alloys of Ni with 4.8% Mn, 4.0% Al, 0.38% Mg, and 3.5% W were used as cores, with pure electrolytic Ni as a core being used as a control. The experiments showed that both the d.c. and pulsed emission of oxide cathodes are dependent on the core to a marked degree. (P15, Ni)

121-P. The Electric Conductance of Liquid Iron Oxide. J. W. Tomlinson and H. Inouye. *Journal of Chemical Physics*, v. 20, Jan. 1952, p. 193.

Results of experiments on the above in equilibrium with solid Fe. Results were typical of a semiconductor of the type exemplified by solid, nonstoichiometric oxides of the transition metals. (P15, Fe)

122-P. Copper Alloys in the Watch Industry. Watch Frames. Philippe De Coulon. Watch Escapements. Simon-Vermot. Nickel-Silver Watch Cases. *Metal Industry*, v. 80, Feb. 15, 1952, p. 127-130.

Includes tabular data on Cu and Ni-Ag alloys covering description, composition, density, expansion, and electrical resistance. Microstructure and mechanical properties. (T9, Cu, Ni, Ag)

123-P. Interaction Between the d-Shell in the Transition Metals. IV. The Intrinsic Antiferromagnetic Character of Iron. C. Zener. *Physical Review*, ser. 2, v. 85, Jan. 15, 1952, p. 324-328.

The principles developed in previous papers of this series are applied to interpret the presence of ferromagnetism in beta-centered cubic iron, its absence in face-centered cubic iron. It is found necessary to introduce a new principle, namely that, for minimum energy, the d-shell electrons are distributed among the atoms so as to maximize the total number of pairs of electrons having like spin within the individual atoms. 28 ref. (P16, Fe)

124-P. Theory of Conductivity of Semiconductors. George Jaffé. *Physical Review*, ser. 2, v. 85, Jan. 15, 1952, p. 354-363.

Fundamental equations and boundary conditions. The general procedure for treating the time-dependent equations. Special case of simple a.c. is treated in detail; the complete expression for the frequency dependence of the equivalent susceptance and conductance is established. The theory is compared with the results of a.c. measurements performed on locally manufactured Se disks. (P15, Se)

125-P. Neutron Diffraction Investigation of the Atomic Magnetic Moment Orientation in the Antiferromagnetic Compound CrSb. A. I. Snow. *Physical Review*, ser. 2, v. 85, Jan. 15, 1952, p. 365.

The compound has the nickel ar-

senide structure and shows a marked decrease in magnetic susceptibility as the temperature is lowered from the antiferromagnetic Curie point (450° C.). (P16, Cr, Sb)

126-P. The Saturation Magnetic Moment of Alloys on the Collective Electron Theory. J. E. Goldman. *Physical Review*, ser. 2, v. 85, Jan. 15, 1952, p. 375.

The perturbing effect of an alloying element on the energy bands in a metal. (P16)

127-P. The Electronic Specific Heat in Chromium and Magnesium. S. A. Friedberg, I. Estermann, and J. E. Goldman. *Physical Review*, ser. 2, v. 85, Jan. 15, 1952, p. 375-376.

Results of an experimental investigation. Data are graphed and tabulated. (P12, Cr, Mg)

128-P. The Domain Structure of a Silicon-Iron Crystal. L. F. Bates and C. D. Mee. *Proceedings of the Physical Society*, v. 65, sec. A, Feb. 1, 1952, p. 129-140.

Powder patterns were obtained for the (100) and (011) surfaces of a carefully shaped single crystal of 3% Si iron. Considerable numerical discrepancies, which are attributed to the complicated nature of the closure domains on the (011) surface, were found. 12 ref. (P16, Fe)

129-P. A Study of Surface Closure Domains by the Powder Pattern Technique. L. F. Bates and C. D. Mee. *Proceedings of the Physical Society*, v. 65, sec. A, Feb. 1, 1952, p. 140-144.

The powder patterns in the neighborhood of cavities and inclusions on the surfaces of single crystals of 3% Si iron were studied. The results are evidence for the essential correctness of current views on closure domain structures. (P16, Fe)

130-P. The Approach to Saturation Magnetostriction of Nickel. E. W. Lee. *Proceedings of the Physical Society*, v. 65, sec. B, Feb. 1, 1952, p. 162-163.

Measurements were made of the differential magnetostriction as a function of a steady applied field. Data are graphed. (P16, Ni)

131-P. The Thermal and Electrical Conductivity of Copper at Low Temperatures. R. Berman and D. K. C. MacDonald. *Proceedings of the Royal Society*, ser. A, v. 211, Feb. 7, 1952, p. 122-128.

Conductivity was measured continuously between 90 and 2° K. The specimen, which was of spectrographic purity, was found to have a pronounced minimum in its electrical resistance at about 10° K. Marked disagreement with theory was found in the temperature variation both of thermal conductivity and of Lorenz number. 11 ref. (P11, Cu)

132-P. The Viscosities of Liquid Lithium, Rubidium and Caesium. E. N. Da C. Andrade, and E. R. Dobbs. *Proceedings of the Royal Society*, ser. A, v. 211, Feb. 7, 1952, p. 12-30.

The oscillating-sphere method was applied to determination of viscosities from the melting point upward over a range of temperatures. The peculiarities of the three metals required development of special methods of handling. 16 ref. (P10, Li, Rb, Cs)

133-P. Optical Properties of Very Thin Metallic Films. (In French.) Florin Abeles. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 7, 1952, p. 198-199.

Experiments on a method of determining optical properties. Based on measurements of factors of reflection on the air side and the glass side, and on the transmission factors of thin metallic films. (P17)

134-P. The Law of Variation, as a Function of Applied Potential, of Electrical Resistance of Very Thin Metal-

lic Deposits. (In French.) Nicolas Mostovetch, Boris Vodar, and Thérèse Duhautes. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 14, 1952, p. 305-308. Mathematical analysis plus graphical interpretation. (P15)

135-P. Thermoelectronic Emission From Ferromagnetic Materials. (In Russian.) A. V. Sokolov and A. Z. Veksler. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 1, 1951, p. 27-30.

A theoretical analysis. This effect is compared with the photo effect in Ni. (P16, SG-n, p)

136-P. Causes of Changes of Magnetic Saturation of Fe-Ni-Al High-Coercive-Strength Alloys During Tempering. (In Russian.) O. S. Ivanov and Iu. M. Kazimirov. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 1, 1951, p. 35-38.

Investigated in relation to ordering, various proportions of alloying elements, and electrical resistance. Data are charted.

(P16, Fe, Al, Ni, SG-n, p)

137-P. The Question of Superconductivity of Cadmium. (In Russian.) B. N. Samoilov. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 11, 1951, p. 791-794.

The conductivity of Cd was investigated at temperatures below 1° K. Temperature dependence of the critical field was determined. Data are charted. (P15, Cd)

138-P. Electric and Metallic Properties of Metals and Alloys. J. A. Bate. *Australasian Engineer*, Jan. 7, 1952, p. 79-89.

A review of the metallurgical aspects of electrical conductivity, thermo-electricity, and ferromagnetism. 41 ref. (P15, P16)

139-P. Contact Resistance—the Contribution of Nonuniform Current Flow. W. B. Kouwenhoven and W. T. Sackett, Jr. *Electrical Engineering*, v. 71, Mar. 1952, p. 264-268.

Previously abstracted from *Transactions of the American Institute of Electrical Engineers*. See item 55-P, 1952. (P15)

140-P. Proposed Alternative Method For Measuring Electrical Resistance of Pipe Coatings. J. K. Ballou, R. P. Howell, J. W. Liljeborg, and P. F. Offermann. *Gas Age*, 109, Feb. 28, 1952, p. 30-31, 64.

Previously abstracted from *Corrosion*. See item 13-P, 1952. (P15, L26, ST)

141-P. The Spectral Emissivity of Iron-Nickel Alloys. H. B. Wahlen, Robert Zentner, and James Martin. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 107-108.

Changes with temperature indicate that, between 1200° and 1600° K., abnormal behaviors exist which hitherto have not been suspected. A correlation of emissivity change with change in density of metals is suggested. (P17, Fe, Ni)

142-P. Bonding of Molybdenum Disulfide to Various Materials to Form a Solid Lubricating Film. I. The Bonding Mechanism. Douglas Godfrey and Edmond E. Bisson. *National Advisory Committee for Aeronautics*, Technical Note 2628, 16 pages.

An experimental investigation to determine the mechanism of bonding of MoS₂ and to extend application of the bonding of MoS₂ to a variety of materials. Adherence of dry MoS₂ powder to steel and aluminum; the physical and chemical nature of dusted, rubbed, and bonded MoS₂ films; chemical reactions in the bonding mechanism; and application of MoS₂ to a variety of metals and to glass. Qualitative tests to determine relative adherence of MoS₂ to materials were conducted. Electron diffraction was employed to detect chemical composition of

solid lubricating films and presence of preferred orientation of MoS₂. Tables and graphs. (P13)

143-P. The Magnetic Susceptibility of Chromium. T. R. McGuire and C. J. Kriessman. *Physical Review*, v. 85, ser. 2, Feb. 1, 1952, p. 452-454.

Measured from -195 to 1440° C. and found to increase from 3.42×10^{-6} to approximately 4.30×10^{-6} emu. per g. at the highest temperature. A transition is recorded in the region of 1400° C. marked by sharp increase in susceptibility and temperature hysteresis. 20 ref. (P16, Cr)

144-P. The Nuclear Magnetic Resonance of Titanium and Arsenic. C. D. Jeffries, H. Loeliger, and H. H. Staub. *Physical Review*, ser. 2, v. 85, Feb. 1, 1952, p. 478-479.

(P16, Ti, As)

145-P. The Nuclear Magnetic Moment of Tc. Harold Walchli, Ralph Livingston, and William J. Martin. *Physical Review*, v. 85, Feb. 1, 1952, p. 479.

Briefly tells how the above was determined. (P16, Tc)

146-P. Observations on the Photoelectric Work Functions and Low Speed Electron Diffraction From Thin Films of Silver on the (100) Face of a Silver Single Crystal. Edward N. Clarke and H. E. Farnsworth. *Physical Review*, ser. 2, v. 85, Feb. 1, 1952, p. 484-485.

A search was made for a possible change in structure of the deposited film which might be associated with a decrease in photo-electric work function. (P15, Ag)

147-P. Changes in Work Functions of Vacuum Distilled Gold Films. Chung Fu Ying and H. E. Farnsworth. *Physical Review*, ser. 2, v. 85, Feb. 1, 1952, p. 485-486.

Results appear to indicate that the gold film deposited on a surface at room temperature possesses some structural characteristics different from that of polycrystalline bulk gold and that the structure of the film approaches that of the bulk when the temperature of the film is raised. (P15, M26, L25, Au)

148-P. The Atomic Heat of Lead in the Region of Its Transition to Superconductivity. J. R. Clement and E. H. Quinell. *Physical Review*, ser. 2, v. 85, Feb. 1, 1952, p. 502-503.

Results of an investigation. (P15, Pb)

149-P. Theory of the Electrical Conductivity of Metals. I. (In German.) H. Koppe. *Zeitschrift für Naturforschung*, v. 7a, Jan. 1952, p. 17-22.

A method of treating "transport" phenomena in metals especially suitable for Fermi-effect calculations. (P15)

150-P. The Anomaly of the Electromagnetic and Thermomagnetic Transverse Effect. (In German.) H. Fieber, A. Nedoluha, and K. M. Koch. *Zeitschrift für Physik*, v. 131, No. 2, 1952, p. 143-155.

On the basis of H. Frölich's equation, coefficients of the four transverse effects are derived; The Ettinghausen and Nernst effects may be considered as secondary thermoelectric effects arising from the longitudinal limitation of the test strips. Relationships of the Hall and the Righi-Leduc effects. A table shows qualitative characteristics of Ag, Al, Cd, Co, Cu, Fe, Ni, Zn, Au, and Sb. (P16)

151-P. Emission of Electrons and Reflection of Ions From Metal Surfaces. (In Russian.) M. A. Ereemeev. *Doklady Akademii Nauk SSSR*, new ser., v. 74, Aug. 11, 1951, p. 775-777.

A study was made of the above at target temperatures up to 1000° K. Sn, Ca, and Li were bombarded with Ta and W ions. Results are charted. (P15, Sn, Ca, Li)

152-P. Intermediate States of Superconductivity. (In Russian.) E. M. Lifshits and Iu. V. Sharvin. *Doklady Akademii Nauk SSSR*, new ser., v. 74, Aug. 11, 1951, p. 783-786.

Experimental data of other investigators were used to make a theoretical analysis of the intermediate states of superconductivity. (P15)

153-P. The Viscosity of Molten Metals. (In Russian.) G. M. Panchenkov. *Doklady Akademii Nauk SSSR*, new ser., v. 79, Aug. 21, 1951, p. 985-988.

The viscosity of molten metals is shown to have the same temperature dependence as many common liquids, hydrocarbons, water, molten salts, etc. Calculated values are compared with experimental data for Na, K, Ag, Cd, Hg, Sn, Pb, Sb, and Bi. (P10)

154-P. Influence of Temperature on the Irreversible Electrode Potential of Aluminum. (In Russian.) V. V. Romanov and G. V. Akimov. *Doklady Akademii Nauk SSSR*, new ser., v. 79, Aug. 21, 1951, p. 989-991.

Investigation using commercial Al in 1N chloride solutions of pH's 1-13 and at 0-80° C. Data are charted. (P15, Al)

155-P. Magnetic Properties of Mercury at Low Temperatures. (In Russian.) B. I. Verkin, B. G. Lazarev, and N. S. Rudenko. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Sept. 1, 1951, p. 45-46.

The magnetic properties of single crystals of Hg were studied at temperatures down to 1.465° K. Data are charted. (P16, Hg)

156-P. The Theory of Coercive Forces and Magnetic Susceptibility of Ferromagnetic Powders (Dependence on Density of Packing). (In Russian.) E. Kondorskii. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Sept. 11, 1951, p. 197-200.

Theoretical, mathematical analysis, with reference to the literature. (P16, SG-n, p)

157-P. The Magnetization of Highly Coercive Ferromagnetic Substances in Weak Fields. (In Russian.) D. I. Volkov. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Sept. 21, 1951, p. 349-351.

An Fe-Co-V alloy (38% Fe, 52% Co, 10% V) was used to study magnetization in fields from 25 to 345 oersteds. Data are charted. (P16, SG-n)

158-P. Optical Properties of Metallic Alloys. (In Russian.) S. V. Vonsovskii, A. A. Smirnov, and A. V. Sokolov. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Sept. 21, 1951, p. 353-356.

The optical properties of a series of Ag-Au alloys were investigated. The data were subjected to theoretical analysis. The degree of ordering is shown to be important with regard to optical properties. (P17, Ag, Au)

159-P. The Nature of Elastic Anomalies in Alloys of the Invar and Elinvar Type. (In Russian.) K. P. Belov and O. N. Agasian. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 21, 1951, p. 881-883.

The elastic and ferromagnetic properties of Fe-Ni, Fe-Pt, Fe-Ni-Co, Fe-Ni-Cr, and Fe-Co-Cr alloys were investigated. Results are charted. (P16, Q21, Fe, Ni, Pt, Co, Cr, SG-n)

160-P. The Fe-FeS-FeO System. (In Russian.) Ia. I. Ol'shanskii. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 21, 1951, p. 893-896.

A study was made of equilibria in the above system. The iron corner of the Fe-S-O diagram is illustrated. Data are tabulated. (P12, M24, Fe)

161-P. Influence of Composition on the Highly Coercive State of Iron-Nickel-Aluminum Alloys. (In Russian.) O. S. Ivanov, Iu. M. Kazimirov, and O. A. Novikova. *Doklady Akademii*

Nauk SSSR, new ser., v. 81, Nov. 11, 1951, p. 231-234.

In order to determine the best composition for a high-coercive-strength alloy, two series of Fe-Ni-Al alloys were studied experimentally. Data are charted. 13 ref. (P16, Fe, Ni, Al)

162-P. The Dependence of Coercive Force on the Size of Powder Particles of Soft Magnetic Materials. (In Russian.) Ia. S. Shur, T. D. Zotov, and I. A. Chebotarev. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 21, 1951, p. 387-389.

The coercive strength of various sized particles of Alsifer (9.4% Si, 5.3% Al, balance Fe) was determined over the range -195 to 300° C. Results are discussed and charted. (P16, H11, Fe, SG-p)

163-P. Certain Peculiarities of the Magnetic Properties of Zinc Monocrystals at Low Temperatures. (In Russian.) B. I. Verkin. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 1, 1951, p. 529-532.

The magnetic properties of single crystals of Zn were studied at 1.8-20.4° K. and in magnetic fields of 1500-15,000 oersteds. Data are charted. (P16, Zn)

164-P. Nearly Square Hysteresis Loops. (In Russian.) M. V. Dekhtiar and L. M. Dekhtiar. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 1, 1951, p. 533-536.

Nearly square hysteresis loops were obtained from permalloy (Fe-Ni alloy) wires recrystallized under a tensile load close to the yield point. Data are charted. (P16, Fe, Ni)

165-P. Temperature Variation of Magnetic Hysteresis in Highly Coercive Alloys. (In Russian.) Ia. S. Shur, N. A. Baranova, and V. A. Zaikova. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 1, 1951, p. 557-560.

Studied for Alnico (51% Fe, 24% Co, 14% Ni, 8% Al, 3% Cu) samples between 195 and 550° C. Data are charted. (P16, Fe, SG-n)

166-P. The Influence of Deformation on the Potentials of Metals. (In Russian.) E. M. Zaretskii. *Zhurnal Prikladnoi Khimii*, v. 24, June 1951, p. 614-623.

See abstract of "Deformation and Corrosion", *Chemical Age*; items 344-R and 368-R, 1951. (R11, Q24, Mg, Al, Cu, Zn, ST)

167-P. Chemical Thermochemistry and Thermodynamics. (In Spanish.) Jose Manuel Perterra. *Técnica Metalúrgica*, v. 7, Aug. 1951, p. 281-295.

Volatilization of metals during melting, Dalton's law of partial pressures, thermodynamics of chemical reactions, variation of enthalpy and free energy with temperature, specific heat of iron, heat of the α -Fe/ γ -Fe and reverse transformations; specific heat of iron oxides; free energy of formation of FeO and Fe₂O₃; solution of FeO in molten Fe; and composition of the oxide film on Fe. Data are tabulated and charted. (P12, Fe)

MECHANICAL PROPERTIES AND TEST METHODS; DEFORMATION

246-Q. Thermal Shock Tests on Gas Turbine Materials. M. Bentele and C. S. Lowthian. *Aircraft Engineering*, v. 24, Feb. 1952, p. 32-38.

Effects of severe temperature fluctuations on rotor blades and nozzle segments. Two forms of thermal shock tests are proposed. Materials include high-temperature alloys, fer-

ritic high-temperature steel, copper, and porcelain. 12 ref. (Q23, AY, SS, Cu)

247-Q. New Heat-Resistant Alloy Is Developed. *Inco Magazine*, v. 25, Winter 1951-52, p. 13-14.

Incoloy—an alloy developed for resistance to high temperature and corrosion. Tabulated tensile properties. (Q general, R general, Ni, SG-g, h)

248-Q. Lower Alloys Developed For High-Temperature Use. C. L. Clark. *Iron Age*, v. 169, Feb. 21, 1952, p. 98-102.

Low-alloy steels modified for use at 1100° F. Development programs and results obtained. Mechanical properties of the various types. Tabular data. (Q general, AY, SG-h)

249-Q. Effect of a Copper Surface Film on Twinning in Zinc Mono-Crystals. John J. Gilman. *Nature*, v. 169, Jan. 26, 1952, p. 149-150.

Results of an investigation show that an electrodeposited film of Cu markedly increased the critical stress required to cause twinning of monocrystals. The effect does not seem to be caused simply by the mechanical strength of the copper. Data are tabulated. (Q24, Zn, Cu)

250-Q. Thermal Dependence of Elastic Constants of Electrodeposited Chromium. H. Pursey. *Nature*, v. 169, Jan. 26, 1952, p. 150.

Measurements of Young's modulus and modulus of rigidity were made at frequencies between 15 and 160 kc. per sec. over the range 10-80° C. on a tube of electroformed Cr which had been annealed for 15 hr. at 544° C. by a resonance method using magnetostrictive exciters and receivers. Data are graphed. (Q21, Cr)

251-Q. Hard Facing for Impact. Howard S. Avery. *Welding Journal*, v. 31, Feb. 1952, p. 116-143; disc. p. 143-145.

Static and dynamic compression testing data for important hard facing alloys; importance of engineering to avoid tension. Critical limitations of impact energy and velocity to minimize structural damage and to help in alloy selection. Hard facing alloy types are steels, carbides, alloy irons, and nonferrous-base alloys. A few representative applications; advantage of composite structures in wear control. (Q6, Q28, L24, SG-m)

252-Q. Stress Studies of Bulkhead Intersections for Welded Tankers. Wm. R. Campbell, L. K. Irwin, and R. C. Duncan. *Welding Journal*, v. 31, Feb. 1952, p. 68s-75s; disc. p. 75s-77s.

The elastic stress distribution at room temperature, strain distribution prior to failure at 0° F., and energy for failure at 0° F. Stress values in the region of the intersection are compared with stresses in the longitudinal bulkhead bordering the intersection. Stress concentrations and energy at failure for the different specimens are also compared. (Q25, K general, ST)

253-Q. Fracturing and Fracture Dynamics. G. R. Irwin and J. A. Kies. *Welding Journal*, v. 31, Feb. 1952, p. 95s-100s.

A descriptive review. A direct application of energy-balance principles for calculating conditions for development of rapid fracturing. Photomicrographs illustrate fractures in ferrous and nonferrous metals. (Q26)

254-Q. Fatigue Tests of Arc Welded Joints. H. de Leiris and H. Dutilleul. *Welding Journal*, v. 31, Feb. 1952, p. 104s. (Translated and condensed from "Study of Fatigue in Welded Assemblies," H. DeLeiris, and "Testing Fatigue in Electric Arc Welded Joints," H. Dutilleul.)

Previously abstracted from *Soudeur et Techniques Connexes*. See items 416-Q and 517-Q, 1951. (Q7, K9)

255-Q. Plans for Switches, Frogs, Crossings, Spring, and Slip Switches. M. J. Zeeman, chairman. *American Railway Engineering Association Bulletin*, v. 53, Feb. 1952, p. 772-774.

Plans to provide improved track support at the approaches to open-deck bridges and trestles. Minimum requirements for tensile properties of bolts and nuts. (Q27, T23, CN)

256-Q. Service Tests of Solid and Manganese Insert Crossings Supported by Steel T-Beams and Longitudinal Timbers. M. J. Zeeman, chairman. *American Railway Engineering Association Bulletin*, v. 53, Feb. 1952, p. 776-778.

Results of service tests on installations of 1946, and May 1949. (S21, Q9, T23, AY, CN)

257-Q. Service Tests on Various Types of Joint Bars. T. A. Blair, chairman. *American Railway Engineering Association Bulletin*, v. 53, Feb. 1952, p. 868-876.

Field work, analysis of data, and report of the measurements. (S21, Q9, CN)

258-Q. Causes of Shelly Spots and Head Checks in Rail: Methods for Their Prevention. L. S. Crain, chairman. *American Railway Engineering Association Bulletin*, v. 53, Feb. 1952, p. 899-920.

Compares performance of heat treated and control-cooled rails, and service tests of heat treated rail on the C. & O., Penna., N. & W., and Great Northern Railways. Includes appendices. "Tenth Progress Report of the Shelly Rail Studies at the University of Illinois," and "Summary of Progress on Investigation of Steel Relaxation in Rail Steel," separately abstracted. (S21, T23, ST)

259-Q. Tenth Progress Report of the Shelly Rail Studies at the University of Illinois. R. E. Cramer. *American Railway Engineering Association Bulletin*, v. 53, Feb. 1952, p. 902-915.

Results of mechanical and cradle rolling-load tests on rail specimens of C, Mn, Si, Cr, Ni, and V alloy steels. Photomicrographs. (S21, Q9, ST)

260-Q. Recent Developments Affecting Rail Section. W. J. Cruise, chairman. *American Railway Engineering Association Bulletin*, v. 53, Feb. 1952, p. 920-940.

Measurement of stresses in 115-RE and 132-RE rail in curved track, stresses developed around the bolt hole of a rail with the joint in tension, redesign of 100-RE rail and joint bars, and rail-web bolt-hole finish effects on fatigue failure. (Q25, Q7, CN)

261-Q. Extent of Strain of Primary Glide Planes in Extended Single Crystalline Alpha Brass. R. Maddin. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 270.

Shows that strain distribution originates in the incongruent nature of the slip process. Use of a two-stage rotation process seems valid in attempting to explain the relation between the orientation of recrystallized grains and the matrix from which they have grown. (Q24, Cu)

262-Q. Preferred Orientation of Arc-Cast Molybdenum Sheet. M. Semchyshen and G. A. Timmons. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 279-286.

Mechanical properties were measured at varying angles to the rolling direction to determine the effect of preferred orientation on anisotropy in Mo sheet which had been straight, cross, or compression rolled. Includes photomicrographs, graphs, and tabular data. 15 ref. (Q24, F23, Mo)

263-Q. Properties of Magnesium-Thorium and Magnesium-Thorium-Cerium Alloys. T. E. Leontis. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 287-294.

Results of a systematic study of the effects of compositional variation on tensile properties, creep resistance, conductivity, density, and metallography of Mg-Th alloys containing up to 50% Th both in the sand-cast and in the extruded states. The effect of addition of Ce to Mg-Th alloys is also reported. Photomicrographs and tabular data. (Q general, P general, M27, Mg)

264-Q. A Bridge Circuit for Wire Resistance Strain Gauges. B. V. Hamon. *Journal of Scientific Instruments*, v. 29, Feb. 1952, p. 53-54.

A strain-gage bridge circuit in which Waidner-Wolff adjustable resistance elements are used in the measuring arm. This type of element has some advantages over the more usual slide-wire measuring element where both wide range and a high accuracy are required. (Q25)

265-Q. A High-Strength Die Steel That Can Be Cold Hobbed. G. E. Brumbach. *Machinery* (London), v. 80, Feb. 14, 1952, p. 267-272.

See abstract from *Machinery* (American) item 770-Q, 1951. (Q29, Q9, T5, AY)

266-Q. Plastic Deformation of Magnesium Single Crystals. E. C. Burke and W. R. Hibbard, Jr. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 295-303.

Studied by tensile tests at room temperature, utilizing an improved preparation and testing technique. Consistent critical resolved shear-stress values for basal slip were obtained. The advent of pyramidal slip at room temperature was rationalized upon the basis of grip constraints. A bend-twinning hypothesis is advanced as an explanation of mechanical twinning which occurs as a complex stress-relief mechanism. 26 ref. (Q24, Mg)

267-Q. Challenges Statement About Aluminum Bearings. F. G. Forrester. *Metal Progress*, v. 62, Feb. 1952, p. 79-80.

Refers to "Improved Aluminum Bearings (Al-Sn and Al-Sn-Cu Alloys)", H. K. Hardy, E. A. G. Liddiard, J. Y. Higgs, and J. W. Cuthbertson, *Metal Progress*, Oct. 1951 (see item 565-E, 1951). Points out that Cu-Pb alloys with Pb contents of 25-40% have similar properties to the Al-Sn Alloys. (Q general, M27, Pb, Cu, Al, SG-c)

268-Q. Deformation Pattern. J. J. Buczynski and N. J. Finsterwalder. *Metal Progress*, v. 62, Feb. 1952, p. 83.

How the ends of 0.068-in. o.d. by 0.026-in. i.d. capillary tubes illustrate dislocations, slip lines and twins. (Q24)

269-Q. Dilastrain Method for Determining Endurance Limit of Materials. Joseph L. Rosenholtz and Dudley T. Smith. *Metal Progress*, v. 62, Feb. 1952, p. 85-88.

The principle of the method is that the coefficient of linear thermal expansion of materials decreases abruptly at the true endurance limit. Results with ferrous and non-ferrous alloys. (Q7)

270-Q. Basic Stages of Deformation. *Metal Progress*, v. 62, Feb. 1952, p. 98, 100, 102. (Condensed from "Three Basic Stages in the Mechanism of Deformation of Metals at Different Temperatures and Strain-Rates", W. A. Wood, G. R. Wilms, and W. A. Rachinger.) Previously abstracted from *Journal of the Institute of Metals*. See item 327-Q, 1951. (Q24)

271-Q. Zr and Ti Substitutions for Manganese in Steel. *Metal Progress*, v. 62, Feb. 1952, p. 162, 164. (Condensed from "Behavior of Zirconium and Titanium in Steels With Particular Emphasis on the Conservation of Manganese", William W. Austin, Jr.)

See abstract of "Titanium and Zirconium—Emergency Substitutes for Manganese", *Steel*, item 745-Q, 1951. (Q23, Q6, Ti, Zr, AY)

272-Q. Equal-Strength Design of Tension-Field Webs and Uprights. Ralph H. Upson, George M. Phelps, and Tung-Sheng Liu. *National Advisory Committee for Aeronautics, Technical Note 2548*, Jan. 1952, 46 pages.

A method for proportioning thin-web beams to attain equal strength of web and uprights which may in turn be employed toward optimum design of these components. Improved empirical formulas for this purpose are developed and the results checked by experimental loading of six-beams. The empirical formulas developed are subject to the limitations of the imposed conditions of this investigation and proportions of uprights as brought out in the experimental results and conclusions. Test specimens were constructed of Al alloy. Graphs and tables. (Q23, Al)

273-Q. A Study of Poisson's Ratio in the Yield Region. George Gerard and Sorrel Wildhorn. *National Advisory Committee for Aeronautics, Technical Note 2561*, Jan. 1952, 30 pages.

Poisson's ratio for the Al alloys 14S-T6, 24S-T4, and 75S-T6. The test data are for simple tensile or compressive loading along three orthogonal axes. Data are graphed. (Q21, Al)

274-Q. Internal Friction in Iron and Steel. J. D. Fast and L. J. Dijkstra. *Philips Technical Review*, v. 13, Dec. 1951, p. 172-179.

Damping experiments, at different temperatures, with a torsion-wire pendulum made of iron or steel containing a little C or N in solution (with or without the admixture of Mn), throw some light upon the extent to which the dissolved atoms precipitate after quenching of the metal. How the internal friction resulting from the solute atoms jumping from one interstice in the crystal lattice to another causes the amplitude of the torsional oscillations to decay exponentially. Results of the damping experiments make it possible to give a new explanation of the mysterious phenomenon of "magnetic aging". (Q22, Q8, N7, Fe, ST)

275-Q. General Theory of Small Elastic Deformations Superposed on Finite Elastic Deformations. A. E. Green, R. S. Rivlin, and R. T. Shield. *Proceedings of the Royal Society, ser. A*, v. 211, Feb. 7, 1952, p. 128-154.

A theoretical and mathematical analysis, especially for the case when the finite deformation is purely homogeneous. (Q21)

276-Q. I.C.I.'s Creep Test Research Station. Eustace C. Larke. *Times Review of Industry*, v. 6, Feb. 1952, p. 27-28, 30.

Work conducted by the Imperial Chemical Industries. Form and significance of the information obtained. (Q3)

277-Q. The Cause of "Training" in Fatigue Stress. (In German.) F. Vitovec. *Berg-und Hüttenmännische Monatshefte der Montanistischen Hochschule in Leoben*, v. 97, Jan. 1952, p. 3-5.

Observed phenomenon of increasing fatigue strength by removing a thin layer of material from the surface of stressed material is explained on the basis of reduction of the notch effect because of reduction in the number of submicroscopic

cracks in the surface. Includes graphs and diagrams. (Q7)

278-Q. Grain Refining of Steels by Hot Working. (In German.) Richard Werner. *Berg-und Hüttenmännische Monatshefte der Montanistischen Hochschule in Leoben*, v. 97, Jan. 1952, p. 15-17.

A series of experiments on the various factors that determine the grain structure of hot worked steels. An empirical formula for estimation of grain-size reduction. (Q24, ST)

279-Q. Phenomenological Theories of Creep. A. Graham. *Engineer*, v. 193, Feb. 8, 1952, p. 198-201; Feb. 15, 1952, p. 234-236.

A formula with four adjustable constants relating permanent strain to stress, time, and temperature, is shown to represent successfully the decelerating stage of uniaxial creep in several dissimilar metals. Applications to tertiary creep, the tensile test, and stress relaxation. Data are compared for Nimonic 80, G-18-B, Stellite 8, Hiduminium RR-59, OFHC Cu, and high-purity Pb. 48 ref. (Q3, Cu, Pb, Ni, Co)

280-Q. Ship Research. S. Livingston Smith. *Engineering*, v. 173, Jan. 25, 1952, p. 105-106; Feb. 1, 1952, p. 156-160; Feb. 8, 1952, p. 185-187.

An investigation of stresses and deflections in mild steel ship plates. Stresses due to welding were studied. Vibration characteristics; design of propellers and boilers. (Q25, K9, CN)

281-Q. On the Empirical Law of Adhesive Wear. J. T. Burwell and C. D. Strang. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 18-28.

Measurements were made of the wear of rubbing steel surfaces as a function of load, distance of travel, and hardness under controlled conditions which eliminated the effects of all factors except adhesion. Results are discussed in the light of the current adhesion theory of dry friction. (Q9, SG-m, ST)

282-Q. Investigation of Stress-Strain Relations of Metal Wires by Electrical Resistance Changes. Irwin Vigness. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 43-47.

A method by which the stress-strain curve of a wire tensile specimen can be derived from measurements of its changes of electrical resistance as a function of strain. Examples illustrate the linear resistance-strain relations and applications of the method for several suitable materials. The resistance-strain characteristics of several materials that are not suitable. A statement of some mechanisms responsible. (Q27, P15)

283-Q. Bend and Vibratory Stress in Winding Ropes. Richard Saxton. *Mining Journal*, v. 238, Feb. 15, 1952, p. 170-171.

Construction, groove wear, and vibratory stress. Cast iron sheaves or drums are satisfactory where the pressure does not exceed 450 psi., and those made of cast steel for pressures between 800-900 psi., while Mn steel easily withstands pressures up to 2000 psi. Mn steel is recommended particularly for sheaves. (Q5, Q25, T7, AY)

284-Q. Creep in Metals. A. D. Schwöpe, F. R. Shober, and L. R. Jackson. *National Advisory Committee for Aeronautics, Technical Note 2618*, Feb. 1952, 52 pages.

Results of a study of creep in single crystals of high-purity aluminum. At low stresses, the creep phenomenon appears to be consistent with Mott and Nabarro's theory of exhaustion creep, while at higher stresses, results appear to be more in accord with ideas expressed by Andrade. Graphs and tables. 25 ref. (Q3, Al)

285-Q. Fatigue Strengths of Aircraft Materials. Axial-Load Fatigue Tests on Notched Sheet Specimens of 24S-T3 and 75S-T6 Aluminum Alloys and of SAE 4130 Steel With Stress-Concentration Factor of 1.5. H. J. Grover, W. S. Hyler, and L. R. Jackson. *National Advisory Committee for Aeronautics*, Technical Note 2639, Feb. 1952, 22 pages.

(Q7, ST, Al)

286-Q. Plastic Deformation and the Meyer Constants of Metals. M. A. Meyer and K. J. Blok Van Laer. *Nature*, v. 169, Feb. 9, 1952, p. 237-238.

Results of experiments on well-annealed samples of Sn, Zn, and Cd. (Q24, Sn, Zn, Cd)

287-Q. Grain Movements During Creep. R. C. Giffkins. *Nature*, v. 169, Feb. 9, 1952, p. 238-239.

An investigation of the creep properties of a range of solid-solution alloys of Ti in Pb; and of their mode of deformation. (Q3, Ti, Pb)

288-Q. The Production of Large Tensile Stresses by Dislocations. J. S. Koehler. *Physical Review*, ser. 2, v. 85, Feb. 1, 1952, p. 480-481.

An edge-type dislocation has large tensile stresses associated with it. Maximum tensile stress is calculated. (Q25, M26)

289-Q. Selecting Hard Facing Materials to Resist Impact, Heat, Friction, Abrasion. Howard S. Avery. *Product Engineering*, v. 23, Mar. 1952, p. 154-159.

Classifies hard-facing alloys by composition. A graded series of wear resistant alloys. Data on mechanical properties. Covers irons, steels, various alloys, and tungsten carbide composites. (Q9, Q6, SG-m, Fe, ST, W C-n)

290-Q. Torsional Fatigue Failures. J. O. Almen. *Product Engineering*, v. 23, Mar. 1952, p. 168-170.

Analytical studies of fatigue fractures in alloy steel torsion-bar springs for military vehicles, in spite of inherent planes of weakness, show that torsional fatigue failures are caused by, and develop normal to, the tensile component of the applied stress. Characteristics of torsional failures obtained from fatigue tests of torsion bars which were subjected to experimental variations in processing. (Q7, Q1, AY)

291-Q. Steel Brittleness Studied. *Steel*, v. 130, Mar. 10, 1952, p. 146, 148.

Results of NBS tests on carbon steels containing 0.9 or 1.6% Mn, 0.2-0.3% Si, and variable N. Results showed that N is beneficial to low-temperature notch toughness if present as aluminum nitride but detrimental if in other nitride forms. (Q23, CN)

292-Q. Some Aspects of Research on Friction and Wear. F. T. Barwell. *Transactions of the Institution of Engineers & Shipbuilders in Scotland*, v. 95, pt. 2, 1951-52, p. 64-91; disc., p. 91-100.

Mechanical, physical, and chemical means for examining surfaces. The problem of fretting corrosion, the advantages of artificial protective films on surfaces, and the design of bearings. Experiments illustrated the existence of vortices at high speeds. Measurements on thrust bearings operating at 5000 r.p.m. Problems involved in the operation of ball and roller bearings at high speeds. (Q9, R1, SG-c)

293-Q. Some Recent Developments in Semihard Steels for Welded Construction. (In French.) C. Fornaci. *L'Ossature Metallique*, v. 16, Dec. 1951, p. 603-607.

Two kinds of steel, one with a small content of Mn-Cr, the other with a small content of Mn-Cr-Cu, and their use in the production of high-pressure tubing. Mechanical properties and weldability. Micro-

graphs, charts, and photographs. (Q general, K9, AY)

294-Q. Creep. (In French.) Maurice de Courcel. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 847-849, 851-852.

Brief outline of the phenomenon of creep in monocrystalline and polycrystalline metals, giving results of tests on pieces susceptible to creep. Micrographs, diagrams, and photographs. (Q3)

295-Q. Microhardness and Its Metallurgical Applications. (In French.) H. Buckle. *Revue de Métallurgie*, Dec. 1951, p. 957-965; disc., p. 965.

Different kinds of microhardness testers and the special laws of microhardness. Diagrams, photographs, charts, and micrographs. 47 ref. (Q29)

296-Q. Internal Stresses in Continuous Aluminum Casting. (In German.) A. Roth. *Giesserei*, v. 38, Dec. 27, 1951, p. 667-668.

Discussion concerning a previous article by G. Seeger. (See item 526-Q, 1951). Includes author's reply. (Q25, C5, Al)

297-Q. X-Ray Microstructure Investigations of the Creep of Steel. (In German.) W. Epprecht. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 18, Jan. 1952, p. 10-21.

X-ray studies were made to investigate changes of austenite crystals in the range 570-750° C. Results show that creep, manifested by slip of austenite crystals, has a strain hardening effect. The experiments were made with variation of temperature, load, and time. Includes tables and X-ray diagrams. 26 ref. (Q3, ST)

298-Q. Mechanical Aging (Strain Aging) of Hard-Drawn Patented Steel Wire. (In German.) Fritz Schweir. *Stahl und Eisen*, v. 72, Jan. 17, 1952, p. 58-66.

Results of aging experiments on wires of different carbon content and diameter. Variations of mechanical properties are extensively tabulated and charted. 13 ref. (Q general, G23, N7, CN)

299-Q. Effect of Surface Condition on Fatigue Bending Strength. (In German.) Paul Gimmel. *Werkstoffe und Korrosion*, v. 2, Dec. 1951, p. 461-462.

Discrepancies in published fatigue test results are shown to be largely due to different surface conditions. Fatigue test results were found to be influenced by methods and time of polishing the test specimens. Results for two steels and Armco iron. Photomicrographs, graphs, and tables. (Q7, ST)

300-Q. Present Status of the Quality Requirements for Copper Wire in the Electrical Industries. (In German.) Rudolf Reinbach. *Zeitschrift für Erzeugung und Metallhüttenwesen*, v. 5, Jan. 1952, p. 9-14.

The basic causes of substandard Cu wires with respect to conductivity, workability, and surface quality. Graphs, photographs, and tables. (Q general, P15, Cu)

301-Q. Displacement Structures in Cubic Face-Centered Crystals. II. (In German.) Horst-Dietrich Dietze. *Zeitschrift für Physik*, v. 131, No. 2, 1952, p. 156-169.

Derivation of Peierl's equation is improved. Points of attack of the forces in the slip plane are clarified; hence the atomic structure of the slip plane in Peierl's equation is retained. Data are graphed and tabulated. (Q24)

302-Q. Investigation of the Mechanical Properties of Welded Joints in Circular Specimens. (In Russian.) A. S. Fal'kevich and I. E. Neifel'd. *Avto-gennoe Delo*, v. 22, May 1951, p. 18-20.

Tests were made on circular specimens cut from welded carbon steel tubes and similar articles. The test method and results, compared with

data from standard specimens. Data are tabulated and charted. (Q general, K9, CN)

303-Q. Thermodynamic Criteria of Resistance to Plastic Deformation of Saturated Solid Solutions of Metals. (In Russian.) K. A. Osipov and B. P. Stoiukhin. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 1, 1951, p. 627-630.

Criteria are developed in conformance with Le Chatelier's law and well-known experimental data. Results are charted. (Q24, P12)

304-Q. (Book) Studies in Large Plastic Flow and Fracture. P. W. Bridgman. McGraw Hill Book Co., 330 West 42nd St., New York 18, N. Y. \$8.00.

Collects, into a coordinated whole, the results of original experiments by the author on fracture and plastic flow. The author's life-long experimental work has been in the field of high pressures, in which he has pushed the range of pressures, experimentally controllable in the laboratory, from 3000 to 100,000 kg. per sq. cm. In this pressure range, extensive investigations were made of the properties of matter. (Q24, Q26)

R CORROSION

102-R. British Study Corrosion of Steel, Iron Pipe. *Iron Age*, v. 169, Feb. 21, 1952, p. 97.

Stresses cathodic protection. Tabular data give results of tests on steel and cast-iron pipe in various soils. (R8, R10, ST, CI)

103-R. Corrosion by Retained Treatment Chemicals on Phosphated Steel Surfaces. S. G. Clarke and E. E. Longhurst. *Journal of the Iron and Steel Institute*, v. 170, Jan. 1952, p. 15-18.

Results of humid-atmosphere corrosion tests. A simple performance test is suggested as a guide if the corrosive tendency of a phosphating solution is not known, or if the geometry of the parts treated makes effective washing difficult. (R6, L14, ST)

104-R. How Six Plants Cut Corrosion Rates By 95%. William C. Uhl. *Petroleum Processing*, v. 7, Feb. 1952, p. 190-197.

The relatively high molecular weight, semipolar inhibitors employed are believed to function by their adsorption on metal surfaces to form well-organized films, one molecule in thickness. Tables, graphs, and diagrams. (R10)

105-R. Cathodic Protection of Steel Underground. Water & Sewage Works. v. 99, Feb. 1952, p. 83. (From "Potential and Current Requirements for the Cathodic Protection of Steel in Soils." W. J. Schwerdtfeger and O. N. McDorman.)

Previously abstracted from *Journal of Research of the National Bureau of Standards*. See item 380-R, 1951. (R10, ST)

106-R. Prevention of Damage Due to Brine Drippings on Track and Structures. W. E. Cornell, chairman. *American Railway Engineering Association Bulletin*, v. 53, Feb. 1952, p. 779.

An investigation of nontoxic additives for prevention of corrosion due to brine drippings. (R5, CN)

107-R. New Way to Detect and Locate Corrosion. J. B. McAndrew, W. H. Colner, and H. T. Francis. *Chemical Engineering*, v. 59, Feb. 1952, p. 305-308.

See abstract of "Rotogenerative Detection of Corrosion Currents", National Advisory Committee for Aero-

- nautics, Technical Note 2523; item 2-R, 1952. (R11)
- 108-R. Electrochemical Studies of Anaerobic Corrosion in Presence of Sulphate-Reducing Bacteria.** F. Wormwell and T. W. Farrer. *Chemistry & Industry*, Feb. 2, 1952, p. 108-109.
- Electrode potential measurements on mild steel specimens were made in media inoculated with *Desulfovibrio desulfuricans* and a sterile control. (R11, R1, CN)
- 109-R. Scale in Turbine Blading; Its Cause, Its Influence on Performance and Its Prevention.** R. T. Rolfe. *Iron & Steel*, v. 25, Feb. 1952, p. 53-55. (Reprinted from *Allen Engineering Review*).
- Scale deposits were found to be composed substantially of boiler salts carried over in the steam. Data are tabulated. (R4, ST)
- 110-R. The Reaction Between Uranium and Oxygen.** Daniel Cubicciotti. *Journal of the American Chemical Society*, v. 74, Feb. 20, 1952, p. 1079-1081.
- Uranium was found to oxidize according to a parabolic law at low temperatures and according to a linear law at higher temperatures. (R2, U)
- 111-R. Hydrogen Evolution From the Tin-Iron Couple in Alkaline Solution.** S. C. Britton. *Journal of Applied Chemistry*, v. 1, Suppl. Issue 2, 1951, p. S132-S136.
- Corrosion of Sn in strongly alkaline solutions may be accelerated by contact with iron and may proceed even in the absence of O_2 , H_2 being evolved from the iron. The degree of acceleration depends on the area of exposed iron. During the cleaning of tinned ware in alkaline solution, contact of the work with a bare steel tank should be avoided, to reduce corrosion of the Sn. (R5, L12, Sn, Fe)
- 112-R. Corrosion of Welded 18/8 Type Chromium-Nickel Steels in Concentrated Nitric Acid.** H. T. Shirley. *Journal of the Iron and Steel Institute*, v. 170, Feb. 1952, p. 111-118.
- A study of attack by concentrated HNO_3 on Ti-stabilized Cr-Ni steels. The mechanism is essentially an extension of intercrystalline corrosion from boundary Cr impoverishment. Data are tabulated. Photomicrographs. (R6, SS)
- 113-R. Discussion on the Paper—"Protection of Structural Steelwork Against Atmospheric Corrosion."** J. C. Hudson. *Journal of the Iron and Steel Institute*, v. 170, Feb. 1952, p. 153-156.
- Covers the paper published in June 1951 issue. See item 292-R, 1951. (R3, ST)
- 114-R. The Corrosion Resistance of Some "Minor" Metals; A Review of the Available Information.** *Metal Industry*, v. 80, Feb. 1, 1952, p. 83-85; Feb. 8, 1952, p. 111-113.
- First part: Ti and Ti-Cr alloys. Second installment: Cu, Zr, Mo, Ta, and Ta-Mo alloys. 12 ref. (R general, Ti, Cr, Cu, Zr, Mo, Ta, EG-b)
- 115-R. The Salt-Spray Test.** *Metal Industry*, v. 80, Feb. 15, 1952, p. 123-126.
- History, methods, types of apparatus, and uses. (R11)
- 116-R. Corrosion of Magnesium Alloy ZK60A in Marine Atmosphere and Tidewater.** Fred M. Reinhart. *National Advisory Committee for Aeronautics, Technical Note 2632*, Feb. 1952, 10 pages.
- Investigation showed that the unprotected alloy was so rapidly attacked in tidewater that it would be of no practical value in applications subject to sea-water exposure. In a marine atmosphere, rate of corrosion was much less. Here, the alloy should give good service if adequately protected. Data are tabulated. Micrographs. (R3, R4, Mg)
- 117-R. Corrosion Problems.** 1952. H. O. Teeple. *Paper Trade Journal*, METALS REVIEW (40)
- v. 134, Feb. 22, 1952, p. 127-128.
- Various approaches to the solution of corrosion problem in pulp and paper mills. (R general)
- 118-R. Metallic Corrosion.** W. H. J. Vernon. *Research*, v. 5, Feb. 1952, p. 54-61.
- Principles are broadly surveyed with special reference to the controlling factors in immersed, underground, and atmospheric corrosion and their application to the prevention of corrosion under service conditions. 26 ref. (R general)
- 119-R. Corrosion-Resistant Mist Prevents Rust.** *Steel*, v. 130, Feb. 25, 1952, p. 83.
- How Wheeling Steel Corp. utilizes VPI, a volatile corrosion inhibitor marketed by the Shell Oil Co. (R10, ST)
- 120-R. "Immunization" of Metallic Surfaces Against the Action of Corrosive Agents.** (In French.) Jean Loiseau. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 7, 1952, p. 260-262.
- Formation of a monomolecular layer of Cassius purple on a polished Ag or Cu plate. This imparts to the plate a remarkable resistance to oxidation and reaction with sulphur. Application to other metals and mechanism of the protective action. "Immunization" is defended as a suitable term for the particular type of protection. (R10, Ag, Cu)
- 121-R. The War Against Rust; the Introduction of Inhibitors.** *Australasian Engineer*, Jan. 7, 1952, p. 92-93.
- Plastic, fluid, thin film, and solvent types of petroleum-base rust preventives. (R10)
- 122-R. Protects Aluminum.** *Aviation Week*, v. 56, Mar. 3, 1952, p. 51.
- A new specially treated tissue paper which prevents water staining of stacked Al sheets, developed by Kaiser Aluminium and Chemical Corp. (R10, Al)
- 123-R. Corrosion Problems in Processing.** U. R. Evans. *Canadian Chemical Processing*, v. 36, Feb. 1952, p. 38, 40-41.
- The main types of corrosion encountered in chemical industry, in connection with water cooling systems. (R4)
- 124-R. Hydrogen Sulphide Corrosion Cracking of Steel.** L. W. Vollmer. *Canadian Mining and Metallurgical Bulletin*, v. 45, Feb. 1952, p. 103-109; *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 55, 1952, p. 89-95.
- Results of an investigation. The failures of 9% Ni steel tubing were initiated by stress-corrosion cracking. Data are tabulated. Micrographs. (R1, AY)
- 125-R. Cathodic Protection of Moving Underwater Equipment.** William S. Merrithew. *Corrosion* (Technical Section), v. 8, Mar. 1952, p. 90-92.
- Successful operation of a cathodic protection system to safeguard moving underwater equipment at the water softening and filtration plant of the Metropolitan Water District, Southern California. Mg anodes are used. (R10, ST, Mg)
- 126-R. Chemical Treatment to Mitigate Corrosion.** J. G. Jewell. *Corrosion* (Technical Section), v. 8, Mar. 1952, p. 100-108.
- A review of surface-active and ionic-type corrosion inhibitors, methods of neutralization and buffering, removal of corrosive agents, self-repairing coatings, and bactericides. Anodic and cathodic agents, and the various factors incident to the use of these types of inhibitors. Organic inhibitors, adsorption inhibitors, pickling inhibitors, oil-wetting agents, and special applications of anticorrosion additives. 39 ref. (R10)
- 127-R. Some Effects of Cathodic Protection on Conventional Paints.** L. P. Sudrabin, F. J. LeFebvre, D. L. Hawke, and A. J. Eickhoff. *Corrosion* (Technical Section), v. 8, Mar. 1952, p. 109-114.
- Four groups of tests were set up in fresh and in salt water to determine suitability of various combinations of paint coatings and cathodic protection for steel structures immersed in water or buried in soil. Results are tabulated. (R10, CN)
- 128-R. Low-Energy Measurement Problems in Cathodic Protection.** H. N. Hayward and R. M. Wainwright. *Electrical Engineering*, v. 71, Mar. 1952, p. 276-278. (To be published in *AIEE Transactions*, v. 71, 1952.)
- Some elementary methods of obtaining metal-to-soil potential measurements are analyzed for the purpose of developing rugged yet sufficiently accurate field measuring equipment. These potentials often must be known for cathodic-protection work. (R11, R10)
- 129-R. Causes and Prevention of Corrosion.** Arthur Marsden. *Gas Journal*, v. 269, Feb. 13, 1952, p. 413-414, 419-420, 425; disc., p. 425-426, 429.
- Contact of dissimilar metals; non-uniformity of the metal, whether due to impurities or to segregation; presence of oxygen in the surrounding medium; internal stresses in metals; stray electric currents, which often assist in the destruction of gas and water mains; and elevated temperatures. Various forms of protection. (R general)
- 130-R. How You Can Avoid Boiler Tube Corrosion.** H. F. Hinst. *Heating, Piping & Air Conditioning*, v. 24, Mar. 1952, p. 77-83.
- An analysis and discussion of the types and causes of corrosion of steel boiler tubes. Seven general rules for avoiding serious tube corrosion problems. (R4, ST)
- 131-R. Semi-Accelerated Corrosion Tests of Medium and High Tensile Steel in Contact with Phenolic Foam.** H. J. Start, J. Kaminetsky, and R. R. Winans. *Journal of American Society of Naval Engineers*, v. 64, Feb. 1952, p. 49-57.
- Action of three types of phenolic foam and of balsa wood with respect to corrosion of steel and relationships between the pH measurements on water extracts of crushed samples and the observed corrosive effects. Micrographs. Data are tabulated. (R11, R7, CN, AY)
- 132-R. The Distinguishing Characteristics of Boiler Tube Failures.** Frank E. Clarke. *Journal of American Society of Naval Engineers*, v. 64, Feb. 1952, p. 83-94.
- "Cavities" and "scars" are defined as pits, grooves, gouges, and wasted areas which have resulted in obvious internal or external loss of tube metal, without evidence of abnormal temperatures. They include generalized corrosion, steam gouging, and mechanical scars. "Cracks and fissures" category includes all failures which occur as narrow slits or crevices without significant deformation of tube shape or loss of metal. The various types are illustrated. (R1, Q26, ST)
- 133-R. The Chemistry of Marine Corrosion.** Carvel Hall Blair. *Journal of American Society of Naval Engineers*, v. 64, Feb. 1952, p. 121-126.
- The theory of corrosion of metals and how a knowledge of this theory can be put to practical use. (R1, R4)
- 134-R. Cathodic Protection Checks Water Ills.** Sheppard T. Powell. *Pow-er*, v. 96, Mar. 1952, p. 71-73, 202, 204, 206, 208.
- Analyzes the principle of cathodic protection of metals and evaluates methods, giving advantages and precautions. (R10)
- 135-R. The Oxidation of Metals in an Artificial Atmosphere.** (In Dutch.)

C. H. Luiten. *Smit Mededelingen*, v. 6, Oct.-Dec. 1951, p. 122-126.

Oxidation of metals in a controlled atmosphere will take place if the dissociation pressure of the metal-oxide is smaller than the O_2 pressure of the surrounding atmosphere. Also, in so-called O_2 -free atmospheres, a certain amount of O_2 exists which may be calculated from the equilibrium data of the dissociation of CO_2 or H_2O . The O_2 pressure appears to depend on and to vary with the square of the CO_2 - CO or H_2O - H_2 ratios. Therefore, in an atmosphere containing CO_2 , CO , H_2O , and H_2 , these ratios are not independent. Some practical conclusions. (R2)

136-R. Oxidation of Metallic Uranium. (In French.) Jean Lortiers. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 2, 1952, p. 91-93.

Compares the oxidation mechanism of U with that of Ce above $140^\circ C$. Diagrams. (R2, U, Ce)

137-R. Protection Against Corrosion and Use of Low-Alloy Steels. (In French.) D. Bermane. *L'Ossature Métallique*, v. 17, Jan. 1952, p. 42-48.

Results of atmospheric tests on uncoated and paint-coated steels of various compositions. Tables, diagrams, charts, and photographs. 15 ref. (R3, AY)

138-R. Micrographic Study of the Oxidation of Iron and of the Transformations of Iron Protoxide. (In French.) G. Chaudron and R. Collongues. *Revue de Métallurgie*, Dec. 1951, p. 917-922; disc., p. 922.

Study of formation of FeO on the surface of the metal; its decomposition into Fe_2O_3 and Fe . Laboratory method for preparation of the oxide layer; constitution and mode of formation of the oxide film; and decomposition of the protoxide. Photomicrographs. (R2, M27, Fe)

139-R. Effect of Wetting Agents on Corrosion Resistance. II. Effect of Non-Ionic Wetting Agents. (In German.) Luigi Piatti. *Werkstoffe und Korrosion*, v. 2, Dec. 1951, p. 441-444.

Nonionic wetting agents are shown to be more effective than ionic wetting agents in preventing the pitting effect of tap water and in removing tuberculation from steels. Tables and graphs show effect of type and concentration of wetting agent and of time of exposure. Photomicrographs. (R4, ST)

140-R. Chemical Reactions in Central Hot-Water Supply Systems. (In German.) Gunther Seelmeyer. *Werkstoffe und Korrosion*, v. 2, Dec. 1951, p. 448-456.

Years of experimentation reveal that the materials of hot-water systems continuously react with the circulating water, and that the effect of chemical reactions depends not only on temperature but also on all other operating conditions. Methods of inhibiting formation of rust, sludge, and oxide scale. Data are tabulated. (R4)

141-R. Problems of Acceptance and Supervision of Chemical Apparatus With Respect to Materials of Construction. (In German.) Kurt Richard. *Werkstoffe und Korrosion*, v. 2, Dec. 1951, p. 457-461.

Reliability and safety require the testing of apparatus exposed to the effects of chemicals and heat, especially since these two factors frequently reduce strength and chemical resistance of initially satisfactory materials. Methods of testing. Materials of construction include carbon and various alloy steels. Micrographs and graphs. (R general, T29, CN, AY)

142-R. Chemical Problems in the High-Pressure Power Plant. (In German.) Kurt Wickert. *Werkstoffe und Korrosion*, v. 3, Jan. 1952, p. 17-29.

Numerous factors, including salt,

CO_2 , O_2 , high-temperature corrosion, stress-corrosion, etc., to be considered in designing high-pressure power plants. Use of the Benson boiler. Diagrams, photographs, photomicrographs, graphs, and tables. (R4)

143-R. Behavior of Cr-Ni Steels in Sulfuric Acid. (In German.) *Werkstoffe und Korrosion*, v. 3, Jan. 1952, p. 31-34.

Brief factual discussion includes extensive tables and graphs. (R5, AY, SS)

144-R. Thermobalance Study of Oxidation of Metals. Copper-Tin Alloys. (In Italian.) F. De Carli and N. Colari. *Metallurgia Italiana*, v. 44, Jan. 1952, p. 1-5.

Study involved continuous photographic recording of weight changes. In the case of Cu-Sn alloys, a depression in the oxidation is evident for the α -phase, which becomes more and more pronounced as it approaches saturation of the primary solid solution. The γ -phase, on the other hand, is more readily oxidizable, whereas the ϵ -phase is practically nonoxidizable. Further developments of this method may prove to be of interest in the study of industrial heat resisting alloys. 30 ref. (R2, Cu, Sn)

145-R. Research on Salt-Spray Corrosion Tests; Characteristics of the Fog. (In Italian.) G. Bianchi and A. Mora. *Metallurgia Italiana*, v. 44, Jan. 1952, p. 9-13.

Experiments on the operation of the salt-spray chamber for corrosion tests were carried out by means of sedimentation tests, using a new solarized photographic-plate method. Dimensions of the fog particles were also determined. Apparatus is diagrammed; results are charted. (R11)

146-R. Corrosion of Metals by Hydrocarbon Solutions of Aliphatic Acids. (In Russian.) L. G. Gindin and V. A. Kazakova. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Sept. 21, 1951, p. 389-392.

The corrosion of Mg, Fe and Pb by solutions of acetic, butyric, valeric, caproic, and lauric acids in benzene, isooctane, and petroleum ether was investigated. Data are tabulated and charted. 11 ref. (R5, Mg, Fe, Pb)

147-R. The Influence of the Solvent in Acid Solutions on Their Behavior Toward Metals. (In Russian.) L. G. Gindin, V. A. Kazakova, and L. N. Putilova. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 11, 1951, p. 777-780.

A study was made of the corrosion of Fe and Cu by solutions of butyric acid in water, benzene, isooctane, and vaseline oil. Data are tabulated. 21 ref. (R5, Fe, Cu)

S INSPECTION AND CONTROL

130-S. Bath Pyrometry. W. T. Sergy. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 185-195.

The primary types of bath pyrometers currently popular are the blowing-tube radiation type, and the Pt-Pt+13% Rh thermocouple. Use of these instruments at the Pittsburgh works of Jones and Laughlin Steel Corp. and data accumulated since installation of the bath pyrometers. (S16, D2, ST)

131-S. Recent Development in Openhearth Bath Temperature Control. T. J. Hoby and R. J. McCurdy. *Proceed-*

ings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers, v. 34, 1951, p. 196-202.

A survey. Records of heats of various steels are given. (S16, D2, ST)

132-S. Openhearth Bath Pyrometry. Kenneth J. Vogel. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 202-205; disc., p. 205-207.

Observations made on a Leeds and Northrup bath immersion pyrometer which was put into operation on openhearth furnaces at Edgar Thomson Works, U. S. Steel Co. (S16, D2, ST)

133-S. Steel-Plant Process Control. J. L. Scarry and D. A. Hayes. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 238-247.

A realistic approach to the solution of the type of process-control problems that may arise in the steel industry; methods used. Graphs. (S18)

134-S. Observations on the Nature of Cracks in Porcelain Enamel. Henry N. Staats. *American Ceramic Society Bulletin*, Feb. 1952, p. 33-38.

Use of the electrified-particle inspection method in locating cracks in glass and porcelain enamel too narrow to reflect light. Includes theory of the method's operation as applied to various types of cracks, relationship between cracks, and performance. (S13, L27)

135-S. Service Tests of Designs of Manganese Castings in Crossings at McCook, Ill. M. J. Zeeman, chairman. *American Railway Engineering Association Bulletin*, v. 53, Feb. 1952, p. 774-775.

Tests indicate that from the standpoint of extent of cracks, the shot peened casting has performed better than the Morden-Ramapo design. No conclusions are justified as to the benefits from shot peening. (S21, Q9, T23, AY)

136-S. Investigation of Failures in Railroad Rails. R. E. Cramer. *American Railway Engineering Association Bulletin*, v. 53, Feb. 1952, p. 843-849.

Results of tests on 52 rails submitted by 15 railroads. A summary and discussion of failures, along with tabulated data for each rail. Photographs. (S21, CN)

137-S. Rail Failure Statistics, Covering (a) All Failures; (b) Transverse Fissures; (c) Performance of Control Cooled Rail. Ray McBrien, chairman. *American Railway Engineering Association Bulletin*, v. 53, Feb. 1952, p. 849-866.

Includes failures reported by 64 railroads on all of their main-line railway mileage. (S21, CN)

138-S. Joint Bar Wear and Failures. Revision of Design and Specifications for New Bars, Including Insulated Joints and Bars for Maintenance Repairs. E. E. Chapman, chairman. *American Railway Engineering Association Bulletin*, v. 53, Feb. 1952, p. 876-894. Includes Appendices: "Tenth Progress Report of the Rolling-Load Tests of Joint Bars," R. S. Jensen; and "Service Tests on the Burlington Railroad Near Fort Morgan, Colo., of Joint Bars of Different Metallurgical."

Detailed information and results of service tests. Includes rolling-load tests, ways of increasing fatigue life, micrographs revealing decarburization, effects of heat treatment and of chemical composition. (S21, Q9, CN)

139-S. Rail Failures Resulting From Engine Wheel Burns, Including Effect of Repairing Such Burns by Oxy-Acetylene or Electric Welding. J. B. Akers, chairman. *American Railway*

- Engineering Association Bulletin*, v. 53, Feb. 1952, p. 894-898. (S21, K1, K2, CN)
- 140-S. Ferrous Metallurgy.** H. F. Beeghly. *Analytical Chemistry*, v. 24, Feb. 1952, p. 252-258.
Recent advances in ferrous analytical chemistry. Includes new reagents, new apparatus, improved techniques, methods for making analytical separations, and methods for determining smaller amounts by simple procedures. 172 ref. (S11, Fe)
- 141-S. Nonferrous Metallurgy.** M. L. Moss. *Analytical Chemistry*, v. 24, Feb. 1952, p. 258-265.
Reviews literature since 1949 on methods for analysis of nonferrous metals. 325 ref. (S11, EG-a)
- 142-S. Determination of Carbon, Oxygen, and Sulfur in Copper; Vacuum Fusion Analysis Using the Mass Spectrometer.** W. M. Hickam. *Analytical Chemistry*, v. 24, Feb. 1952, p. 362-366.
10 ref. (S11, Cu)
- 143-S. 2,9-Dimethyl-1, 10-Phenanthroline; New Reagent Specific in Spectrophotometric Determination of Copper.** G. Frederick Smith and W. H. McCurdy, Jr. *Analytical Chemistry*, v. 24, Feb. 1952, p. 371-373. (S11, Cu)
- 144-S. The Application of Quality Control in Steel Operations, Ford Motor Company; Statistical Quality Control at the Rolling Mill. Part II.** H. W. Clark. *Blast Furnace and Steel Plant*, v. 40, Feb. 1952, p. 201-207.
Methods established for realizing standards of quality performance. (S12, F23, ST)
- 145-S. Industrial Applications of Sonic Energy.** C. Richard Soderberg, Jr. *Iron and Steel Engineer*, v. 29, Feb. 1952, p. 87-94; disc., p. 94-95.
Sonic methods are proposed to clean openhearth gases. They also show promise for other steel-plant applications such as agitators for pickling. (S18, D2, L12)
- 146-S. The Control of Quality on Mass-Produced Engineering Parts.** *Machinery* (London), v. 80, Feb. 14, 1952, p. 296-300.
Recommendations concerning the application of multigaging machines for checking parts on a 100% basis. Details for several machines. (S14)
- 147-S. Calibration Furnaces.** Frances Mortimer. *Research*, v. 5, Feb. 1952, p. 82-85.
Two new furnaces designed for the calibration of total radiation pyrometers. Although intended primarily for steelworks and laboratory use, the details of the construction of these furnaces should interest many industrial laboratories. (S16)
- 148-S. Firing Temperatures Controlled.** Michael Bozzin. *Steel*, v. 130, Feb. 25, 1952, p. 82-83.
System in which electronic recording instruments, riding through furnaces in a specially designed box, give porcelain enamellers closer control of furnace temperatures during production. (S16, L27)
- 149-S. Inspection Time Pared.** *Steel*, v. 130, Mar. 3, 1952, p. 78.
Briefly describes the use of Co⁶⁰ in nondestructive inspection for soundness of large castings. (S13, Co)
- 150-S. Radiography of Pipe Welds With Isotopes.** J. G. M. Turnbull. *Welding and Metal Fabrication*, v. 20, Feb. 1952, p. 70-73.
Includes radiographs of test plates. Refers specifically to power-station steam pipes. (S13, K9, ST)
- 151-S. 31-MeV Radiographic Inspection of Metal Parts.** *Brown Boveri Review*, v. 28, Sept.-Oct. 1951, p. 301-310.
Directions for the radiographic inspection of metal workpieces. Shows, by means of practical examples, that the fault sensitivity and sharpness of definition of the radio-
- graphs obtained with 31-MeV X-rays are excellent. Radiographic technique is shown to be much simpler with 31-MeV radiation than with conventional X-ray inspection. Radiographs of iron parts are shown. (S13)
- 152-S. Radioisotopes Aid Metallurgy, Part I.** Gordon H. Guest. *Canadian Metals*, v. 15, Feb. 1952, p. 16-17.
The role of radio-isotopes in the study of metals, their characteristics and application in diffusion processes, corrosion studies, steelmaking, flotation, and radiography. (To be continued.) (S19)
- 153-S. X-Ray Testing of Welds for High-Pressure Vessels.** T. B. Johnston. *Gas Times*, v. 70, Feb. 22, 1952, p. 241-242, 247.
Procedure used at Durie Foundry in Leven, Scotland. (S13, K9, ST)
- 154-S. New Tool Steels and Carbides.** *Iron Age*, v. 169, Mar. 6, 1952, p. 228, 232-235, 238-240, 242, 244, 246, 248, 250, 252, 254, 256, 258-277.
A list of the newest tool materials—specifications of more than 400 toolsteels, die steels, and carbides introduced since 1949. (S22, TS, C-n)
- 155-S. Radiography in Engineering.** L. Mullins. *Machinery Lloyd* (Overseas Ed.), v. 24, Feb. 1952, p. 69-81.
Some of the ways in which radiography may help engineers. General theory and advantages of gamma and X-radiography; also the limitations. Actual working methods. (S13)
- 156-S. Immersion Pyrometry in the Steel Industry.** Frances Mortimer. *Metallurgia*, v. 45, Feb. 1952, p. 88-90.
A general account of present practice and future trends. (S16)
- 157-S. How to Interpret the Quality of Antifriction Bearings.** Hilding Törnebohm. *Microtechnic* (English Ed.), v. 5, Nov.-Dec. 1951, p. 387-393; disc., p. 394. (Translated from the French.)
Includes an outline of the checking procedure. (S13, S14, S15)
- 158-S. Analytical Methods for the Determination of Cyanides in Plating Wastes and in Effluents From Treatment Processes.** Earl J. Serfass, Robert B. Freeman, Barnett F. Dodge, and Walter Zabban. *Plating*, v. 39, Mar. 1952, p. 267-273.
The two methods recommended were selected from an experimental investigation of about eight different methods given in the literature. They are intended to determine total cyanide, i.e., not only the cyanide present as the anion, CN⁻, but also that present in various complexes with metals. (S11, L17)
- 159-S. Soviet and Czechoslovakian Structural Steels.** (In Czech.) Ladislav Jenicek. *Hutnické Listy*, v. 6, Nov. 1951, p. 531-537.
The importance of basic raw materials in the production and classification of alloy steels. Czech specifications are compared graphically with Russian ones. (S22, AY)
- 160-S. Analytical Methods of Determining Gases and Nonmetallic Inclusions in Steel.** (In Czech.) Miroslav Sicha. *Hutnické Listy*, v. 6, Dec. 1951, p. 590-593.
Analytical methods for determining amounts of H₂, M₂, and O₂ in steels. Micro-analytical methods were used for nonmetallic inclusions. Vacuum extraction at 1650° C. was used for gaseous analyses. Data are tabulated. 24 ref. (S11, M27, ST)
- 161-S. Physics of Metals; Morphological Analysis of Fractures.** (In French.) H. de Leiris. *Metaux: Corrosion—Industries*, v. 26, Dec. 1951, p. 471-496.
A comprehensive study of the macrostructure of various types of cracks and failures of different metals. Morphological analysis of failures by progressive crack development; and morphological analysis
- of semibrittle tears. Of failures of large tanks and of ships. Numerous macrographs. 24 ref. (S21, Q26, ST)
- 162-S. New Procedures for Electronic Nondestructive Testing of Materials.** (In French.) D. F. Förster. *Metaux: Corrosion—Industries*, v. 26, Dec. 1951, p. 497-513.
Study of the theoretical bases of electronic nondestructive testing of materials with the aid of Foucault currents. Apparatus is diagrammed and illustrated. Includes charts, sketches, and photographs. (S13)
- 163-S. Recent French Contributions to Gas Analysis of Iron and Steel Products.** (In French.) E. Jaudon. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 840, 843, 845, 871.
Recent methods for determining O₂, H₂, and N₂. Photographs, tables, and diagrams. 25 ref. (S11, Fe, ST)
- 164-S. New Analytical Method in Lead Metallurgy and Future Perspectives.** (In French.) Niccolò Rossi Canevari. *Revue de Métallurgie*, Dec. 1951, p. 912-916; disc., p. 916.
A polarographic method for analyzing Pb specimens obtained from the molten mass before casting; use of Pb as protection against nuclear radiation. Polarograms and tables. (S11, T29, Pb)
- 165-S. Study of the Spectral Analysis of Highly Alloyed Steels.** (In French.) J. Eeckhout, J. Cruse, and J. Gillis. *Revue Universelle des Mines, de la Métallurgie des Travaux des Sciences et des Arts Appliqués à l'Industrie*, ser. 9, v. 94, Dec. 1951, p. 440-447.
Possibilities of the method, and conditions likely to furnish the best results. Optimum conditions of excitation were studied and supported by results of analyses checked by chemical methods for the different elements entering into the composition of steel. Tables and charts. 12 ref. (S11, AY)
- 166-S. A New Apparatus for Direct Spectrochemical Analysis.** (In French.) A. Hans. *Revue Universelle des Mines, de la Métallurgie des Travaux des Sciences et des Arts Appliqués à l'Industrie*, ser. 9, v. 94, Dec. 1951, p. 443-451.
Apparatus of Belgian construction. Results obtained on various steel samples. Excellent stability of the new instrument. Circuit diagrams and tables. (S11)
- 167-S. Present State of Temperature Control in the Operation of Blast Furnace Hot Blast Stoves.** (In German.) Erich Martin. *Stahl und Eisen*, v. 72, Feb. 14, 1952, p. 176-185.
Methods used and their limitations. (S16, D1, Fe)
- 168-S. Methods of Determining Oxygen in Metals.** (In German.) J. Fischer and H. Bechtel. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 5, Jan. 1952, p. 14-19.
Surveys literature. Experimental results on the analysis of O₂ especially in Cu, Pb, Al, and Zn. Diagrams, graphs, and tables. 19 ref. (S11, Cu, Pb, Al, Zn)
- 169-S. Statistical Correlation of Highly Scattered Data.** (In Italian.) F. Gatto. *Alluminio*, v. 20, Dec. 1951, p. 533-539.
After explaining the practical limitations of ordinary methods, some improvements are suggested. The methods were applied to determination of the hardness-breaking stress ratio for Al alloys containing Zn, Mg, and Cu. Data are charted. 12 ref. (S12, Q29, Q26, Al)
- 170-S. Swedish Standards for Bronze and Red Brass Ingots.** (In Swedish.) *Gjuteriet*, v. 41, Dec. 1951, p. 186-187. (S22, Cu)

T

APPLICATIONS OF METALS IN EQUIPMENT

113-T. High Lead Copper-Lead Bearings for Slow Speed Diesel Engines. Albert Willi, Jr. *Diesel Power and Diesel Transportation*, Feb. 1952, p. 54-55.

See abstract from *Steel*, item 89-T, 1952. (T7, Cu, Pb, ST, SG-c)

114-T. Germanium Promises an Early Revolution in Electronics. *Engineering and Mining Journal*, v. 153, Feb. 1952, p. 154, 156, 159.

Utilization of electrical properties of Ge. New Ge units are an amplifier or transistor and a rectifier. Advantages and a general survey of the metal and its properties. (T1, P15, Ge)

115-T. Metals, Ceramics, and Seals Used in Vacuum Tubes. Stanley Taylor. *Engineering Experiment Station News* (Ohio State University), v. 23, Dec. 1951, p. 52-55.

Presents some processes for metal-ceramic and mica-metal seals. (T1, K11)

116-T. Aluminum: Where It's Used and Why in Modern Food Handling. Floyd A. Lewis. *Food Engineering*, v. 24, Feb. 1952, p. 77-80, 177-179.

An illustrated survey. (T29, Al)

117-T. Magnesium Is Important in Sikorsky Helicopters. *Magazine of Magnesium*, Feb. 1952, p. 14-15.

Used for the fuselage skin, gear box housing, main wheels, seats for the pilot and co-pilot, and smaller miscellaneous assemblies within the ship. (T24, Mg)

118-T. Fine-Wire Resistors for Measuring and Control Purposes; Technical Principles and Production. (In German.) Otto Schultze. *Zeitschrift des Vereines Deutscher Ingenieure*, v. 94, Jan. 11, 1952, p. 43-47.

The resistors are very fine wires used in apparatus for control of temperature and other variables, and in other apparatus for various purposes. Surveys the various alloys used, their mechanical properties, corrosion and heat resistance, electrical properties, production by rolling and cold drawing, methods of soldering and insulating the wires, and methods of coil winding. Comparative properties of bare and lacquered wires. Photographs, diagrams, and graphs. (T8, SG-q)

119-T. New Aluminum Art Technique. *Light Metal Age*, Feb. 1952, p. 18-20.

New art technique promises to expand the application of Al in the field of decoration. High-purity Al sheet is first treated with dilute acid to produce a "frosty" finish. From a drawing of the desired mural, an outline is traced on the metal. After masking certain areas, the material is scratched with steel wool or other abrasives. When colored lights are directed at the murals, an illusion of iridescence is produced. The effect can be varied in many ways. (T9, Al)

120-T. Aluminum in Motor Cycles and Cycles. *Light Metals*, v. 15, Feb. 1952, p. 49-52, 53.

British applications. (T10, Al)

121-T. New Design for Aluminum Roofs. *Light Metals*, v. 15, Feb. 1952, p. 58-59.

Diagrams and illustrations. (T26, Al)

122-T. Applications of Light Metals. *Light Metals*, v. 15, Feb. 1952, p. 63-65.

Third and concluding section of a bibliography on the application of

Al and Mg and their light alloys which have appeared in *Light Metals* from June 1949 to Dec. 1951, inclusive. (T general, Al, Mg)

123-T. Swedish All-Aluminum Passenger Ships. Valde Oskarson. *Light Metals*, v. 15, Feb. 1952, p. 69-70.

Advantages of Al ships. (T22, Al)

124-T. Manufacture of Gas Turbine Blades; Their Properties, Forging, Heat Treatment and Inspection. H. W. Kirkby. *Metal Treatment and Drop Forging*, Feb. 1952, p. 61-66.

Alloys suitable for both short-life (airplane engine) and long-life gas turbines. The forging of blades, their heat treatment and testing. Data are graphed and tabulated. (T25, F22, J general)

125-T. Alloys vs. Straight Carbon Steel for Mechanical Springs. *Main-spring*, v. 14, Feb. 1952, 4 pages.

Conditions necessary to make pre-tempered wire, and the reasons why some alloy steels do not lend themselves to this process. The patenting process and resulting mechanical properties. (T7, J25, Q general, AY, CN)

126-T. Free Movement Stressed in Copper Roof Design. *Sheet Metal Worker*, v. 43, Feb. 1952, p. 44-45.

Use of heavy-weight cold rolled Cu and heavy soft Cu in roof construction. (T26, Cu)

127-T. Aluminum Foil. *American Pressman*, v. 62, Feb. 1952, p. 18, 20. (Reprinted from "ABC's of Aluminum," Reynolds Metals Co., 1950.)

Uses of the foil. (T10, Al)

128-T. Wider Uses Found for Textured Metals. *Automotive Industries*, v. 106, Mar. 1, 1952, p. 51.

Applications for ferrous and non-ferrous textured metals in automobiles and buses. (T21)

129-T. Stainless Steels in Chemical Handling. *Canadian Chemical Processing*, v. 36, Feb. 1952, p. 64.

Experiences of specific plants. (T29, R5, SS)

130-T. Better Use of Common Metals. *Chemistry*, v. 25, Feb. 1952, p. 27-29.

Includes a new metal-bonding process in which Pb is bonded to steel; use of Al in the bases of incandescent electric light bulbs. (T1, K12, Pb, Al)

131-T. Metal-Surface and Other Fluorocarbon Combinations. Merritt A. Rudner. *Electrical Manufacturing*, v. 49, Mar. 1952, p. 106-110, 282, 284, 286, 288.

Manufacturing techniques now permit practically unlimited "custom-built" combinations of fluorocarbon polymers with a wide range of metals and various organic and inorganic materials. Properties of Teflon and similar fluorocarbon polymers. Application of metallic layers or laminates to the resinous material; or use of metallic or ceramic powders as fillers. A variety of unusual applications of the products. (T1, H general)

132-T. Power Plant Piping. Hugh Welshman, Jr. *Heating, Piping & Air Conditioning*, v. 24, Feb. 1952, p. 88-95; Mar. 1952, p. 86-87.

Design, manufacture, fabrication, installation and operation of modern piping systems. Welding and fabricating details. Preheating and stress relieving with respect to welding carbon and alloy steel pipe. Advantages of prefabricating power piping assemblies. (T27, K general, CN, AY)

133-T. Tests Air Panel Heating, Cooling for Floor or Ceiling Use. R. P. Goemann. *Heating, Piping & Air Conditioning*, v. 24, Mar. 1952, p. 98-99.

Two methods of construction for heating or cooling by means of air circulated within either floors or ceilings. Results of a test installation. The basic material used is a

cellular steel panel which is widely employed as a structural subfloor. The panels are welded to the steel frame of the building and topped with a 2½-in. poured concrete floor. (T27, ST)

134-T. Wanted: Better Materials for Nuclear Reactors. George E. Evans. *Iron Age*, v. 169, Mar. 13, 1952, p. 93-97.

Reactors resemble huge heat exchangers, and materials must have satisfactory physical and thermal properties. Ti, Zr, and Be offer possibilities as construction materials. Bi, Pb, Na, and K can be used as liquid metal coolants. Ceramics and ceramic-metallics offer unusual mechanical properties at high temperatures. Several new alloys are suggested. (T29, P general, Q general)

135-T. How to Choose Spring Materials. M. Gerard Fangemann. *Materials & Methods*, v. 35, Jan. 1952, p. 85-89.

Types of springs, allowable stress and type of stress, vibrating frequency, and type of material applicable. Tabulated data. (To be continued.) (T7, Q general, SG-b)

136-T. Progress in Aluminum and Its Alloys; Current Applications and Future Prospects. P. L. Martyn. *Metallurgia*, v. 45, Feb. 1952, p. 65-69.

A number of interesting applications and future prospects in the light of the re-armament program and growing production capacity. (T general, Al)

137-T. Use and Manufacture of High Precision Antifriction Bearings. M. Pichaud. *Microtechnic* (English Ed.), v. 5, Nov.-Dec. 1951, p. 368-383; disc., p. 384-386. (Translated from the French.)

The precision bearing, its applications, conditions of use, and manufacture. Diagrams and tabular data. (T7)

138-T. For Kaiser's New Smelter: Aluminum Washers & Coolers. *Modern Metals*, v. 8, Feb. 1952, p. 32.

Parts fabricated from Al. (T5, Al)

139-T. How Aluminum Can Replace Tinplate in Containers. G. W. Birdsall. *Modern Metals*, v. 8, Feb. 1952, p. 47-48, 50-51.

See abstract of "Aluminum Containers Stretch Tin Supply," *Steel*; item 479-T, 1951. (T10, Al)

140-T. Lightweight Engine of Die Cast Aluminum. *Product Engineering*, v. 23, Mar. 1952, p. 144-145.

Engine developed by West Bend Aluminum Co., West Bend, Wis. (T25, E13, Al)

141-T. Marine Developments in Aluminum. *Transactions of the Institution of Engineers & Shipbuilders in Scotland*, v. 95, pt. 2, 1951-1952, p. 49-63.

Extensive discussion by various individuals of paper by J. Venus, published in a previous issue. Includes author's reply. (T22, Al)

142-T. Special Light Steel Construction. (In French.) E. Hünnebeck. *L'Ossature Métallique*, v. 16, Dec. 1951, p. 589-593.

Three factors of importance in steel construction are quality of the steel; deformation resistance of the steel; and ease of assembly of sections by rivets, bolts, or welding. Several types of such structures are illustrated. (T26, K general, ST)

143-T. High Resistance ALS Steel for Light Construction. (In French.) A. Bartocci. *L'Ossature Métallique*, v. 16, Dec. 1951, p. 594-598.

Composition and mechanical properties of new types of low-alloy steels having excellent welding characteristics and a higher strength range—80-110 kg. per sq. mm.—than steels with low-alloy compositions. Tables and photographs. (T26, AY)

144-T. Special Alloys and Electrical Resistance Materials. (In French.) M.

Fernier. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 863, 865-867, 869-871.

Special thermal-expansion alloys, thermocouples, special alloys for electrical and magnetic applications, electrical resistors, and thermocouples. Pertinent physical properties are tabulated and charted. (T1, P11, P15, P16, S16, SG-a, q, r, s)

145-T. Triplex Steel for Plow Moldboards. (In French.) M. Dubois. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 879-880.

Relative merits of ordinary open-hearth steel and triplex steel; advantages of the latter. Various methods of surface finishing (hard Cr plating, carburization, nitriding, and chromizing). (T3, J28, L general, CN)

146-T. Magnets. (In French.) M. Allec. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 881, 883, 885-887.

Various types of magnets, their design, composition, and magnetic properties. Graphs, table, and illustrations. (T1, P16, SG-n)

147-T. Toolsteels for Hot Forming. (In French.) M. Pierre Henry. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 893, 895-897, 899.

Use of Cr, Cr-Ni-Mo, Cr-Mo, Cr-W, and high-speed steels; conditions of use, influence of composition and heat treatment, and future possibilities. Photographs and table. (T5, TS)

148-T. Using Special Steels in New Central Power Plants. (In French.) J. Ricard. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 905, 907-909, 911-913.

A historical outline. Use of special steels, particularly for gas turbines. Resistance to high temperature and corrosion. Charts and photograph. (T25, AY, SS)

149-T. Heat Resisting Steels Used in the Construction of Gas Turbines and Aircraft Turbojet Engines. (In French.) E. Morlet. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 915, 917-919, 921, 923.

Operating conditions of the main parts of gas turbines, refractory steels or alloys and their properties and applications, austenitic steels and alloys, and nonferrous alloys. Tables and charts. (T25, Q general, SS, AY, SG-h)

150-T. Alloy Steels in the Construction of Automobiles. (In French.) Pierre Sutter. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 925, 927, 933.

Compositions, properties, and applications. (T21, AY)

151-T. An Aluminum Car for Transportation of Alumina. (In French.) Jean Reinhold. *Revue de l'Aluminium*, v. 28, Dec. 1951, p. 439-447.

Closed-hopper cars of large capacity built for transportation of bulk alumina by a French company. (T23, Al)

152-T. Papermaking. (In French.) Pierre Prévot. *Revue de l'Aluminium*, v. 28, Dec. 1951, p. 433-438.

Al alloy hood 52.6 ft. long and 16.5 ft. wide, built over papermaking machinery in a French plant, to evacuate steam given off by the paper. (T29, Al)

153-T. History and Progress of French Light-Alloy Railroad Cars. (In French.) *Revue de l'Aluminium*, v. 28, Dec. 1951, p. 447-450.

Various types of cars, built for various specialized freight-handling applications. (T23, Al)

154-T. The Couvral Roof. (In French.) Rene Rouaud-Perisse. *Revue de l'Aluminium*, v. 28, Dec. 1951, p. 454-458.

The Couvral process uses Al-Mn strips 0.026 in. thick having dovetail grooves which are fastened to slats. This fastening process, which

avoids making holes in the roofing material, is most efficient as it can stand the tearing effort represented by a load of 545 lb. per sq. ft. (T26, K13, Al)

155-T. The 17th Annual Nautical Exposition. (In French.) André Chevrier. *Revue de l'Aluminium*, v. 28, Dec. 1951, p. 459-465.

Applications of Al and its alloys in ships, boats, marine engines, and accessories. (T22, Al)

156-T. Use of Aluminum for the Construction of Wiring for Short Circuited Rotors for Asynchronous Motors. (In French.) J. Le Monnier. *Revue de l'Aluminium*, v. 28, Dec. 1951, p. 466-469.

Production by gas welding rolled bars onto the rims. (T1, K2, Al)

157-T. Heat Resistant Steels for the Glass Industry. (In German.) H. Kalpers. *Sprechsaal für Keramik; Glas; Email*, v. 85, Feb. 5, 1952, p. 53-54.

Composition and mechanical properties of three types of heat resistant steels; carbon steels, Si steels, and Cr steels. (T29, Q general, SG-h)

158-T. Recent Uses of Aluminum in the Chemical Industry. (In German.) P. Juniere. *Werkstoffe und Korrosion*, v. 3, Jan. 1952, p. 1-5.

Previously abstracted from *Aluminium Suisse*. See item 486-T, 1951. (T29, Al)

159-T. Aluminum as Material in the Dairy Plant. (In German.) David Stüssli. *Werkstoffe und Korrosion*, v. 3, Jan. 1952, p. 5-11.

Al, especially the Al alloy "anticorrosodal", is far superior to other materials for dairy equipment and containers. 22 ref. (T29, Al)

160-T. Cast Structural Material. (In German.) W. Hartmann. *Zeitschrift des Vereines Deutscher Ingenieure*, v. 94, Jan. 21, 1952, p. 65-73.

Advantages and disadvantages of cast iron and welded or forged steel for machine parts. Close cooperation of the designer with the foundryman is recommended. Data are graphed and tabulated. (T7, CI, ST)

161-T. Requirements of Friction Bearings, Especially Those Made of Synthetic Resins. (In German.) Heinrich Mäkel. *Zeitschrift des Vereines Deutscher Ingenieure*, v. 94, Feb. 11, 1952, p. 138-145.

Review of literature compares the properties and qualities of different metallic and nonmetallic bearing materials. Includes metallic materials and graphites. Illustrations, graphs, and tables. 45 ref. (T7, Q general, SG-c)

162-T. Equipment for Cold Forming. (In French.) L. Colombier. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 901-903.

Carbon toolsteels and low and high-alloy toolsteels, their properties and heat treatment. Progress being made on improvement of performance. Charts. (T5, TS)

163-T. (Book) Aluminum Powder and Pastes. 84 pages. Reynolds Metals Co., 2500 S. Third St., Louisville, Ky.

Powdered Al in Al paints, iridescent auto finishes, roof coatings, and the like; and describes chemical reactions which provide heat without flames, sea markers to help locate downed airmen, bombs whose destructive power is doubled by powdered Al, powder metallurgy, surgery, silicosis treatment, and other developments. (T29, L26, H general, Al)

Be Sure to Go—

34th National Metal
Exposition and Congress
Philadelphia, Oct. 20-24, 1952

V

MATERIALS

General Coverage of Specific Materials

50-V. New Magnesium-Zirconium Casting Alloy. J. M. Payne, A. D. Michael, and R. W. Eade. *Metal Industry*, v. 80, Feb. 8, 1952, p. 103-104.

A new Mg casting alloy containing Zr, Zn and a rare earth was developed to meet special mechanical strength requirements. This alloy has found application on a large scale for stressed castings. (Mg)

51-V. The Titanium Alloys Today. Walter L. Finlay and Milton B. Vordahl. *Metal Progress*, v. 61, Feb. 1952, p. 73-75.

An over-all view. Differences between α and β alloys. Some mechanical properties of the alloys and heat treatment practices. Micrographs. (Ti)

52-V. Magnesium Alloys. F. A. Fox. *Research*, v. 5, Feb. 1952, p. 77-81.

Surveys present status of development, in comparison with those available in 1940. Mechanical and physical properties, as well as microstructure. (Mg)

53-V. Round-Up on Titanium, V. A Technical Summary of Properties. N. P. Harvey. *South African Mining and Engineering Journal*, v. 62, Jan. 26, 1952, p. 945-947. (Reprinted from *Iron and Coal Trades Review*.)

Physical and mechanical properties, fabrication, structures, alloying element effects, etc. 19 ref. (Ti)

54-V. Titanium and Its Alloys. H. W. Worner. *Australasian Engineer*, Jan. 7, 1952, p. 46-51.

Published information is reviewed in the light of some general physical laws pertaining to alloys. Mechanical properties from the standpoint of the relationships between properties, structure, and heat treatment. A few types of promising heat treatable alloys. Present uses and possible future applications of Ti-rich alloys. 23 ref. (Q general, T general, Ti)

55-V. Titanium Is Tough. Helen M. Davis. *Chemistry*, v. 25, Feb. 1952, p. 1-6.

Advantages of Ti over Fe. Sources and form in which it is found and the various methods by which it is produced. (Ti)

56-V. Boron Steels—a New Era in Alloy Metallurgy. *Journal of American Society of Naval Engineers, Inc.*, v. 64, Feb. 1952, p. 134-140. (Excerpts from article by D. I. Brown.) *Iron Age*, v. 168, July 5, 1951, p. 79-85; July 12, 1951, p. 85-90; July 19, 1951, p. 102-106; July 26, 1951, p. 68-72; Aug. 9, 1951, p. 75-79; disc., p. 79-80.

Previously abstracted from *Iron Age*. See item 109-V, 1951. (AY)

57-V. Copper and Copper Alloys; A Survey of Technical Progress During 1951. E. Voce. *Metalurgia*, v. 44, Dec. 1951, p. 303-308.

Raw material resources, extraction, fabrication, finishing and properties. 85 ref. (To be continued.) (Cu)

58-V. Aluminium and Its Alloys in 1951; Some Aspects of Research and Technical Progress Reported. E. Elliott. *Metalurgia*, v. 45, Feb. 1952, p. 75-80.

Attention is drawn to published work reporting research and technical progress in the various aspects of the metallurgy of aluminum and its alloys, including extraction, founding, fabrication, constitution and properties. 75 ref. (Al)

(Continued on page 46)

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is

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METALLURGICAL ENGINEER: With experience in steel panel fabrication, between 35 and 45 years of age. Work involves design layout, forming, cutting, welding and finishing of steel panels for mounting instruments. Salary open. Applicant should be familiar with press brakes, Wahls strippers, radial drills, ovens, etc. Box 4-135.

INDUSTRIAL ENGINEER: Recent graduate or equivalent experience to help establish standard cost for installation of new cost system. Excellent opportunity for young industrial engineer to advance to responsible position. Box 4-150.

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Mechanical engineer with experience in electromechanical apparatus. For production methods department. Located in North Central Ohio.

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INDUCTION HARDENING ENGINEER: Large farm equipment manufacturer has position open for engineer to supervise experimental induction hardening developments. Must have electrical engineering background, and should be familiar with RF and AF application. Metallurgical background desirable but not required. Box 4-35.

METALLURGIST or CHEMICAL ENGINEER: Recent graduate trained in metallography and analytical chemistry, interested in doing research and development work on wire and wire products. Good opportunity for advancement in long-established progressive company of medium size, eastern Indiana. In reply, state usual details plus draft status and salary expected. Box 4-40.

METALLURGIST, JUNIOR METALLURGIST, and ENGINEER: Research positions open with industrial furnace manufacturer. Box 4-45.

METALLURGICAL ENGINEER: For development work in welding and fabrication in nuclear reactor components, and research in foundry and fabrication of metals and alloys used in nuclear reactors. Direct replies to: Argonne National Laboratory, P. O. Box 5207, Chicago 80, Ill.

METALLURGIST: Forge plant manufacturing large and small drop die steel forgings has opening for metallurgist to take charge of metallurgical department. Experience with forge shop metallurgical problems and heat treating of alloy and stainless steels is essential. Box 4-50.

MECHANICAL ENGINEER: Young man, college education, with mechanical aptitude. Experienced with steel order desk preferred. Accurate with figures. Good opportunity with inviting future in sales. Salary commensurate with ability. Box 4-160.

TOOL STEEL SALESMAN: Young man for Chicago area. Box 4-165.

West

FURNACE ENGINEER: Capable man, experienced in combustion of natural gas, propane, butane and oil, and with heat transfer. Also experienced with air flow and heat distribution through air circulation, having practical background in structural design of furnaces, ovens, salt bath and melting pots. Desire man under 45 years of age, but not mandatory. Should be stable in temperament. Salary range between \$115 and \$140 per week, dependent upon experience and ability. Excellent long-term opportunities for right man in company with progressive expansion program. Box 4-55.

PHYSICAL METALLURGIST: To teach physical metallurgy and some courses in process or production metallurgy. Well-known school of mines, on university campus. Salary and rank open, depending on experience. Box 4-60.

Canada

METALLURGICAL ENGINEER: Experienced in nonferrous extractive metallurgy, preferably some copper refinery experience, for work as plant metallurgist in Eastern Canada copper refinery. Excellent opportunity for advancement. Salary commensurate with ability. Box 4-170.

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Time Study Engineer

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POSITIONS WANTED

PLANT MANAGER, SUPERINTENDENT, MANUFACTURERS' REPRESENTATIVE: Responsible experience in steel wire processing and heat treatment and all manufacturing phases steel springs and metal fabricating, labor relations, sales engineering. Management degree. Registered professional engineer. Age 49, married. Will relocate New England, California, Florida, Latin America, or other. Now employed. Confidential. Excellent references. Box 4-65.

METALLURGICAL ENGINEER: B.S. degree, with 12 years experience in metallurgical and mechanical fields. Qualified as metallurgist or assistant metallurgist of fabricating or manufacturing plant. Available in about two months. Location immaterial. Box 4-70.

MATERIALS ENGINEER: Broadly schooled and experienced in all fields of ferrous production, application, and manufacturing, through metallurgical research, production, and sales work with well-known producers and consumers of both steel and iron. Seeks sales engineering opportunity offering challenging metallurgical representation. B.S. degree, 36 years old. Box 4-75.

RESEARCH METALLURGIST: Ph.D. degree, 31 years old, married. Four years wide industrial experience in research, development and process control. Graduate study on age hardening. Academic experience plus research in corrosion. Interested in research and development and/or corrosion in progressive industry. Location immaterial. Box 4-80.

METALLURGICAL CHEMIST: Long experience in all phases of production of nonferrous alloys from scrap. Has open time and full laboratory facilities in East for analyses, research, etc. Box 4-85.

METALLURGIST: B.S. degree, age 43, married. Sixteen years diversified supervisory experience in ferrous and nonferrous metallurgy in heat treating, laboratory development work, metallography, trouble shooting, and technical sales and customer contact as sales metallurgist. Presently employed as plant metallurgist. Desires employment as sales metallurgist, heat treat superintendent, or metallurgical engineer. Prefer Eastern location. Box 4-90.

METALLURGIST: Graduate, age 29, married, children. Experience includes physical testing, both at room and elevated temperatures, stress rupture, creep and fatigue, and corrosion testing, some quality control work, heat treating and hardenability. Desires position in production or research and development. Box 4-95.

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EMPLOYMENT SERVICE BUREAU

(continued from page 45)

EXECUTIVE ENGINEER: Presently manager of quality control for large company with multiplant operations. Background in light and heavy metal processing and fabricating, including ferrous and nonferrous industries. Metallurgical engineer with business management and accounting. Can qualify for works manager or assistant. Age 34. Complete resume with salary requirements on request. Box 4-100.

METALLURGICAL ENGINEER: B.S. degree. Four years experience in heat treatment of all types of steels, foundry (chilled and gray), ferrous and nonferrous metallurgy, welding, material specifications and inspection, material failure analysis, and recommendation reports, Baldwin strain gage instrumentation. Age 31, married. Desires ferrous testing and development field. Location immaterial. Box 4-105.

FOUNDRYMAN and METALLURGIST: B.S. degree, Bombay University, and diploma from National Foundry College, United Kingdom. Seeks position in India or abroad. Practical experience in India, seven years in nonferrous smelting, refining, alloying and castings. Has also worked in ferrous foundries. Age 35, unmarried, good references. Box 4-110.

METALLURGICAL ENGINEER: Experienced in production and testing of cast light metal alloys; specifically, elevated temperature magnesium alloys. Some ferrous experience. Age 28, veteran, no reserve status. Will consider any location. Desires permanent position with chance for advancement. Box 4-115.

METALLURGIST: Experienced in chemical analysis, determination of engineering properties, examination and inspection of metals and metal parts, research projects, determination of high-temperature properties, corrosion resistance, and stress surveys. Eleven years experience as metallurgist, one year as chemist. Box 4-120.

POWDERED METAL PROCESS ENGINEER: M.E. degree. Nine years experience in control and development of powder mixes, in the management of briquetting, sintering, and other techniques involved in the manufacture of powdered metal products. Box 4-125.

JR. METALLURGICAL ENGINEER: Age 24, married, one child, veteran. Three years college, worked 1½ years in foundry. Would like to locate in West if possible. Box 4-130.

METALLURGICAL ENGINEER: With broad administrative and technical background. Has had extensive experience in ferrous metallurgical process and product control, research and development, customer contact and supervision. M.S. degree. Married, age 35. Executive caliber. Desires a more responsible sales or management position with well-established, progressive firm with opportunity for advancement. Any location. Box 4-175.

METALLURGIST: Graduate, with five years experience with large toolsteel manufacturer. Experience includes laboratory development work, investigation of customer claims and complaints, and customer contacts. Desires position in East but will consider other localities. Is willing to travel. Box 4-180.

METALLURGIST: Degree in industrial engineering. Age 31. Over five years experience as industrial metallurgist. Familiar with all phases of physical testing, metallography, metallurgical inspection, heat treating, materials engineering, and technical report writing. Presently employed but desiring to relocate in Florida. Box 4-185.

METALLURGICAL ENGINEER: Age 27, married, two children, veteran. M.S. degree. One year teaching experience as instructor of metallurgy, one year in present employment with manufacturer of electrical heating elements. Present work involves developmental research and production problems in both

ferrous and nonferrous alloys. Capable of planning and directing laboratory. Desires to relocate, preferably in Wisconsin, Minnesota, or Far West. Box 4-190.

METALLURGIST: M.S. degree, age 37. Wide experience in supervision, heat treating, electroplating, and chemical and metallurgical laboratory. Experience includes production work, tools and dies, engineering specifications, electroplating of cadmium, bright zinc, bright nickel, etc., magnaflux, and trouble shooting. Presently employed as chief metallurgist. Desires position as superintendent or chief metallurgist with progressive company. Box 4-195.

METALLURGICAL ENGINEER: Registered engineer. Has had 27 years diversified experience in ferrous metallurgy, foundry, heat treatment, quality control, and testing. Chief chemist, chief metallurgist, and process engineer. Weld design and supervision of production welding. Electrode development and production. Extensive work on control of wear by hard surface. In Cleveland, but will travel out of the city. Box 4-200.

SUMMER EMPLOYMENT: Wanted by German metallurgical student. Excellent educational background and experience in metal press work, machine shop and foundry. Knowledge of English. Available for June, July, August, and September. Box 4-205.

(Continued from page 44)

59-V. An Investigation of Boron and Other Low-Alloy Steels. Part I. H. B. Knowlton. *Steel Processing*, v. 38, Feb. 1952, p. 72-75.

The present status of boron and other alloy steels, and the basis upon which these steels have been selected, tested, and used. Data on chemical composition and mechanical properties. Tables. (To be continued.) (AY)

60-V. Tool Materials. Lester F. Spencer. *Tool Engineer*, v. 28, Mar. 1952, p. 129-131.

Reviews characteristics. Includes cemented titanium carbides, high-speed Mo steels, and several non-deforming oil and air hardening toolsteels. (TS, Ti, C-n)

61-V. Titanium Takes a Test. J. Segard. *Welding Engineer*, v. 37, Mar. 1952, p. 24-27.

Results of tests conducted by Ryan Aeronautical to determine the suitability of Ti to production of aircraft components. Tests included cold and hot forming, spot welding, heat treating, deformation, and machining. (Q general, K3, G general, Ti)

62-V. Applications of Stainless Steels. (In French.) H. Forder. *L'Ossature Méallique*, v. 16, Dec. 1951, p. 599-602.

Compositions, mechanical and physical properties, and applications. (T general, SS)

63-V. High Speed Steels. (In French.) André Michel. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 873-875, 877.

Brittleness; residual austenite; high-temperature hardness; structure; carbide formation; quenching and tempering; effects of C, Cr, W, Mo, V, and Co; trend of research; and future prospects. (Q general, M27, TS)

64-V. (Book) Gemeinfassliche Darstellung des Eisenhüttenwesens. (Comprehensive Treatise on Ferrous Metallurgy.) Ed. 15. 258 pages. 1949. Verlag Stahleisen, M.B.H., Düsseldorf, Germany.

The beneficiation of iron ore, coking of coal, refractory materials, smelting, innovations in iron and steel production, and modern metallurgical furnaces and other equipment. Includes a survey of iron and steel production in principal countries of the world. Numerous tables, charts, diagrams, and illustrations. (B general, D general, A4, Fe, ST)

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